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TO NASA
CONTRACT NUMBER NASW-3846
U. OF SOUTHWESTERN LOUISIANA
SOUTHERN UNIVERSITY
AUGUST 31, 1984



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F I N A L R E P O R T

to the

NATIONAL AERONAUTICS AND SPACE

ADMINISTRATION

on

NASA CONTRACT NUMBER NASW-3846

"NASA RECON:

COURSE DEVELOPMENT, ADMINISTRATION,

AND EVALUATION"

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The material in this report is based on contracted research activities supported by the National Aeronautics and Space Administration under NASA Contract Number NASW-3846. Any opinions, findings, and conclusions or recommendations expressed in this report are those of the authors and do not necessarily reflect the view or position of the National Aeronautics and Space Administration.

EXECUTIVE SUMMARY:

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In December, 1983, the National Aeronautics and Space Administration (NASA) entered into a contractual agreement (NASA Contract Number NASW-3846) with the University of Southwestern Louisiana (USL) and Southern University (SU) for contracted research and development activities addressing the development, administration, and evaluation of a set of transportable, college-level courses to educate science and engineering students in the effective use of automated scientific and technical information storage and retrieval systems, and, in particular, in the use of the NASA RECON system.

This Executive Summary of the FY 1983-1984 Final Report on NASA Contract Number NASW-3846 will briefly overview the long-range scope and objectives of these contracted activities and will highlight the progress which has been made toward these objectives during FY 1983-1984.

LONG-RANGE SCOPE AND OBJECTIVES

In order to provide an overview of the long-range scope and objectives of the contracted activities, this section will highlight the major thrusts of these activities. In the interest of brevity, focus will be placed on identifying primary objectives, rather than on presenting all supportive details. These objectives are as follows:

- (1) The development of an educational program comprising a set of courses with varying degrees of emphasis on the principles and concepts of interactive information storage and retrieval systems and the specifics of effectively utilizing specific selected systems. The course set includes:
 - (a) 18 week full semester course
 - (b) 12 week full quarter course
 - (c) 6 week mini-course
 - (d) 1-2 day intensive workshops.
- (2) The development of an educational program incorporating extensive hands-on interactive usage of multiple large-scale interactive information storage and retrieval systems and multiple data bases:
 - (a) Initial NASA-funded work is to develop specific course modules addressing NASA RECON.
 - (b) Plans include establishing contractual agreements with other agencies/system vendors to incorporate course modules tailored to additional systems (and their supported data bases), such as DIALOG, DOE/RECON, SDC, BRS, DoD/DTIC/DROLS, etc.
- (3) The development of an educational program targeted at scientific and engineering disciplines; assumptions include non-computer-professional, non-IS&R-professional instructors (science and engineering faculty) and non-computer-professional, non-IS&R-professional audience (senior undergraduate science and engineering students).
- (4) The development of fully transportable educational programs and course materials to facilitate wide distribution of the educational programs to colleges and universities throughout the United States:
 - (a) Course material development philosophy is predicated on a set of system-independent, discipline-independent core materials, with hooks for incorporating system-specific modules and discipline-specific examples throughout.

- (b) Candidate entries within course materials packages include:

- Course syllabi
- Lesson plans
- Overhead transparencies
- Homework assignments with answer keys
- Hands-on usage assignments with answer keys
- Examinations with answer keys
- Discussion topics
- Instructor guides
- Workbooks
- Textbooks
- Bibliographies
- Additional support handouts
- Videotapes and/or films.

- (5) Overall planning and management of phased activities:

- (a) Needs analysis
- (b) Course development
- (c) Pilot course administration
- (d) Pilot evaluation
- (e) Development of "marketing"/distribution plan
- (f) Implementation of "marketing"/distribution plan
- (g) Conduct of regional seminars
- (h) Conduct of on-site seminars
- (i) Coordination of request processing / information dissemination
- (j) Course state-of-the-art enhancements
- (k) Additional system-oriented and data base-oriented enhancements
- (l) Institutional surveys/evaluations
- (m) Graduated student surveys/evaluations
- (n) Periodic statistical summary reporting

- (6) The utilization of educational evaluation results to define required R&D support areas and correspondingly the translation of R&D results into educational applications and enhancements to the educational programs.

As should be evident from the brief overview presented above, this is a very well conceived program which should offer considerable benefits to participating agencies.

OVERVIEW OF FY 1983-1984 PROGRESS AND ACCOMPLISHMENTS

This section will provide a brief executive overview of the progress which has been made and the accomplishments which have been achieved during the FY 1983-1984 efforts on this contract.

Throughout this section, all claims made concerning items of progress and accomplishments will cross-reference the specific documents and deliverables that have been produced during FY 1983-1984 which substantiate the claims. A table of contents of these documents and deliverables is provided as an attachment entitled "FY 1983-1984 Final Report Table of Contents of Documentation/Deliverables Completed to Date". The full text of each of these 39 major deliverables can be found in the Final Report.

The remainder of this Executive Summary will highlight progress made during FY 1983-1984 in the following major areas:

- I. Overall Project Management and Control
- II. Needs Analysis Phase
- III. Course Development Phase
- IV. Working Paper Series Information Dissemination
- V. PC R&D Supportive Research and PC R&D Working Paper Series
- VI. Other Research Support Activities

These six major categories correspond to the major categorization of documentation/deliverables completed to date as illustrated in the attachment to this Executive Summary.

- I. Overall Project Management and Control

In light of the long-range, multi-year orientation of these contracted efforts, serious attention has been devoted to the long-range strategic planning and short-range tactical planning of all tasks and activities in order to ensure the establishment of an overall project management and control philosophy and supportive progress tracking and reporting mechanisms.

This philosophy is predicated on the necessity of adopting a formal methodology for addressing task initiation, definition, scheduling, milestone specification, resource allocation, progress status monitoring, and final documentation. Such a philosophy and resulting methodology was adopted at the very inception of the contract efforts and has been maintained through all subsequent contract activities, resulting in the conduct of a well planned and highly controlled research and development environment in support of all contract efforts.

Examples of the automated project management and control reports that summarize the results of these processes can be found in items 1.1 and 1.2 of the attachment.

II. Needs Analysis Phase

During FY 1983-1984, a transportable information storage and retrieval system courses needs analysis questionnaire was developed and distributed to 237 colleges and universities throughout the United States. The questionnaire was completed and returned by 161 respondents (typically at the level of Academic Vice-Presidents, Deans of Colleges of Physical Sciences, and Deans of Colleges of Engineering).

A very brief overview of some of the major results of the questionnaire follows:

- (1) Computer usage is viewed as a very important or important educational objective in Engineering by 86.8% of the respondents and in Physical Sciences by 68.2% of the respondents.

[Results are highly complementary to our educational objectives.]

- (2) Availability of local computing access facilities is substantial, for example, responses indicate that substantial departmental computer terminals exist (86.7% in Engineering, 79.7% in Physical Sciences) and even substantial departmental personal computers exist (66.7% in Engineering, 59.3% in Physical Sciences).

[Results indicate that availability of local computer access facilities will not be a problem in the local implementation of our online, hands-on oriented educational programs.]

- (3) A substantial number of colleges and universities do already have access to one or more IS&R systems (72.0%); that these systems are typically available to all Engineering departments (68.2%) and/or to all Physical Science

departments (76.6%). However, while these systems are typically available to all faculty (98.3%), to all staff (90.4%), to all students for coursework (68.7%), and to all students for research (87.0%), they are typically being used almost exclusively by librarians (94.8%) and in only 8.6% of the colleges and universities responding were students reported as conducting searches themselves!

[These results provide very strong justification for the need for our educational programs targeted at hands-on use of IS&R systems by the end-users themselves, e.g., students, faculty, and researchers, in contrast to library intermediaries.]

- (4) With respect to college and university interest in offering Physical Science and Engineering students an opportunity to learn the principles and concepts of online IS&R systems and interact with such systems, only 2.5% of the respondents replied in the negative; 67.7% responded "YES", 21.7% undecided, and 7.5% responded that they are presently doing so.

[Results indicate strong interest in the areas that our educational programs are addressing.]

- (5) Funding was identified as the major obstacle to course implementation (82.1%).

[Our PC R&D activities are addressing a number of potential solutions to the known high costs (vendor search time costs, telephone costs, telecommunications costs) of providing substantive, online, hands-on usage of large-scale IS&R systems.]

- (6) An overwhelming majority (86.4%) of the colleges and universities responding indicated interest in incorporating a pre-packaged program (as we are developing) into their curriculum when such programs become available. Again, the most frequently mentioned qualification (81.5%) was funding support.

[Results again represent strong justification for our programs and strong justification for our planned cost reduction approaches via PC R&D activities.]

- (7) With respect to the types of educational material to be incorporated within the pre-packaged educational programs, respondents indicated their desire for virtually all of the types of educational material that we are planning to develop, including course syllabi (73.5%), hands-on usage assignments and keys (65.2%), support handouts (62.1%), workbooks (60.6%), overhead transparencies (55.3%), lesson plans (53.8%), textbooks (51.5%), homework assignments and

keys (49.2%), videotapes/films (47.7%), and bibliographies (43.2%). Only discussion topics (39.4%) and examinations and keys (38.6%) were requested by less than 40% of the respondents.

[Again, the results provide strong justification for the need for the types of educational materials that we are developing and incorporating within the educational programs.]

The complete details and supporting documents associated with our progress within the Needs Analysis Phase of the contract work can be found in items 2.1 through 2.4 of the attachment.

III. Course Development Phase

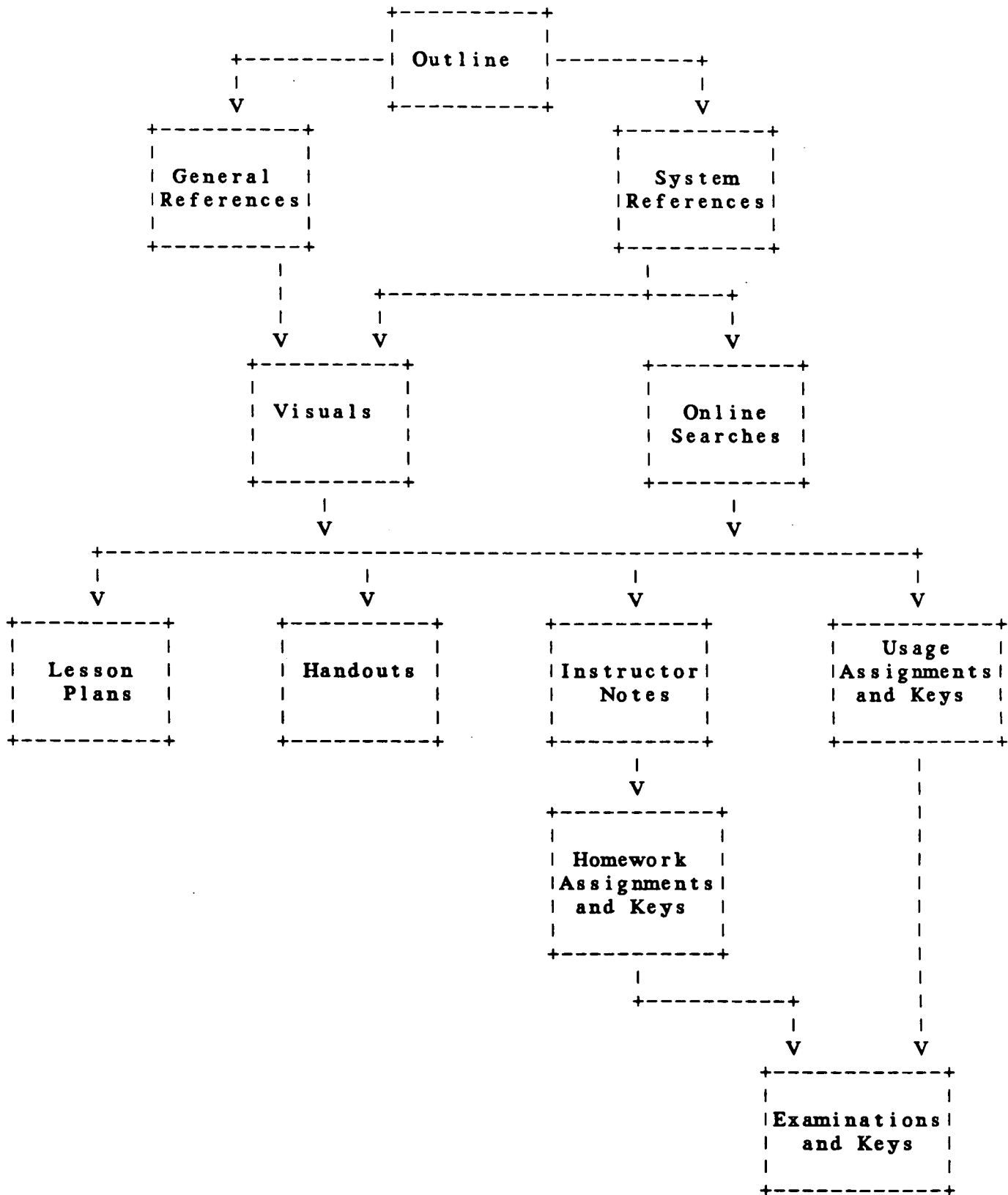
During FY 1983-1984, the most substantial amount of progress that was made revolved around the development of the course materials themselves.

Massive amounts of time were dedicated to the preparation of course development standards for ensuring the structured, standardized, and consistent development of all interrelated course materials (see items 3.1, 3.2, and 3.3 in the attachment) and to the initial drafting, multiple review, and subsequent finalization of very strong preliminary versions of the following course materials: integrated outline of course visuals (item 3.4), course visuals (item 3.5), course lesson plans (item 3.6), course homework assignments and answer keys (item 3.7), and course NASA RECON usage assignments and answer keys (item 3.8).

The Course Materials Development Diagram, presented on the following page, illustrates a schematic of the interrelationships and precedence dependencies that we are incorporating within the development of the course materials.

As just two examples of the productivity of our efforts to date, we have already produced 490 visuals (item 3.5) and lesson plans for 48 interrelated course lesson sequences (item 3.6).

COURSE MATERIALS DEVELOPMENT DIAGRAM



IV. Working Paper Series Information Dissemination

In recognition of the importance of widespread information dissemination concerning the educational programs that we are developing in preparation for the ultimate widespread distribution of these programs to colleges and universities throughout the United States, a formal project working paper series has been established to provide one such information dissemination mechanism.

As with the development of all course materials themselves, the initial task within this dissemination mechanism development process was the definition of a complete, consistent, and standardized set of working paper series standards (see item 4.1 in the attachment).

With the availability of such standards, six working paper series entries have been completed to date (see items 4.2 through 4.7 in the attachment). These working paper series entries have addressed such important state-of-the-art issues within interactive information storage and retrieval systems as the man/machine interface (item 4.5), knowledge-based systems (item 4.6), and natural language query systems (item 4.7).

V. PC R&D Supportive Research and PC R&D Working Paper Series

The USL NASA PC R&D Project was initiated in an effort to explore the possible cost-effective utilizations of personal computers as support R&D tools for the educational program development and distribution phases and as tools for use by engineers and scientists in the processing of information. Recent advances in personal computer technology and resultant increases in the performance/cost ratio of these machines has made them increasingly attractive replacements for terminals as a method of accessing remote information systems. The information processing capabilities associated with personal computers make them particularly attractive to engineering and scientific personnel who desire both local processing capabilities and access to remote information.

The primary direction of research efforts initiated by the project has been the development of a research environment to be utilized by the project and the development of specifications for a number of activities addressing individual tasks within the overall scope of the project. The research environment development is a continuous process which includes the evaluation and testing of both hardware and software tools. All specifications are developed with the goal of maintaining maximum flexibility and portability. The environment available for use

by project members will therefore continue to evolve over time.

The following general goals represent a framework for these development efforts:

1. Create an environment for PC research and development activities.
2. Develop an integrated PC-based environment for scientific and engineering professionals.
3. Provide PC-based instructional tools for training in the use of information storage and retrieval systems (IS&Rs).

These goals will be achieved by specifying objectives and initiating tasks to accomplish those objectives. The following is a list of currently identified objectives.

OBJECTIVES:

1. The objectives for establishing a PC R&D environment include:
 - 1.1 Continually evaluate available PC hardware and software for potential incorporation into the PC R&D projects.
 - 1.2 Develop procedures and specifications for PC R&D activities.
 - 1.3 Identify and evaluate candidate research and development projects.
2. The objectives for developing an integrated PC-based environment include:
 - 2.1 Develop a general means of transporting data between tools in the local environment.
 - 2.2 Develop applications tools for prototyping an integrated PC-based environment.
 - 2.3 Develop a general system for transparent sharing and access of resources in a distributed environment.
 - 2.4 Develop a consistent means for accessing resources located in a remote processing environment.

3. The objectives for providing CAI tools for IS&R training include:

3.1 Develop a simulator for Computer Aided Instruction (CAI) in the use of IS&R systems.

3.2 Develop a simulator generator, retargetable for various IS&R systems.

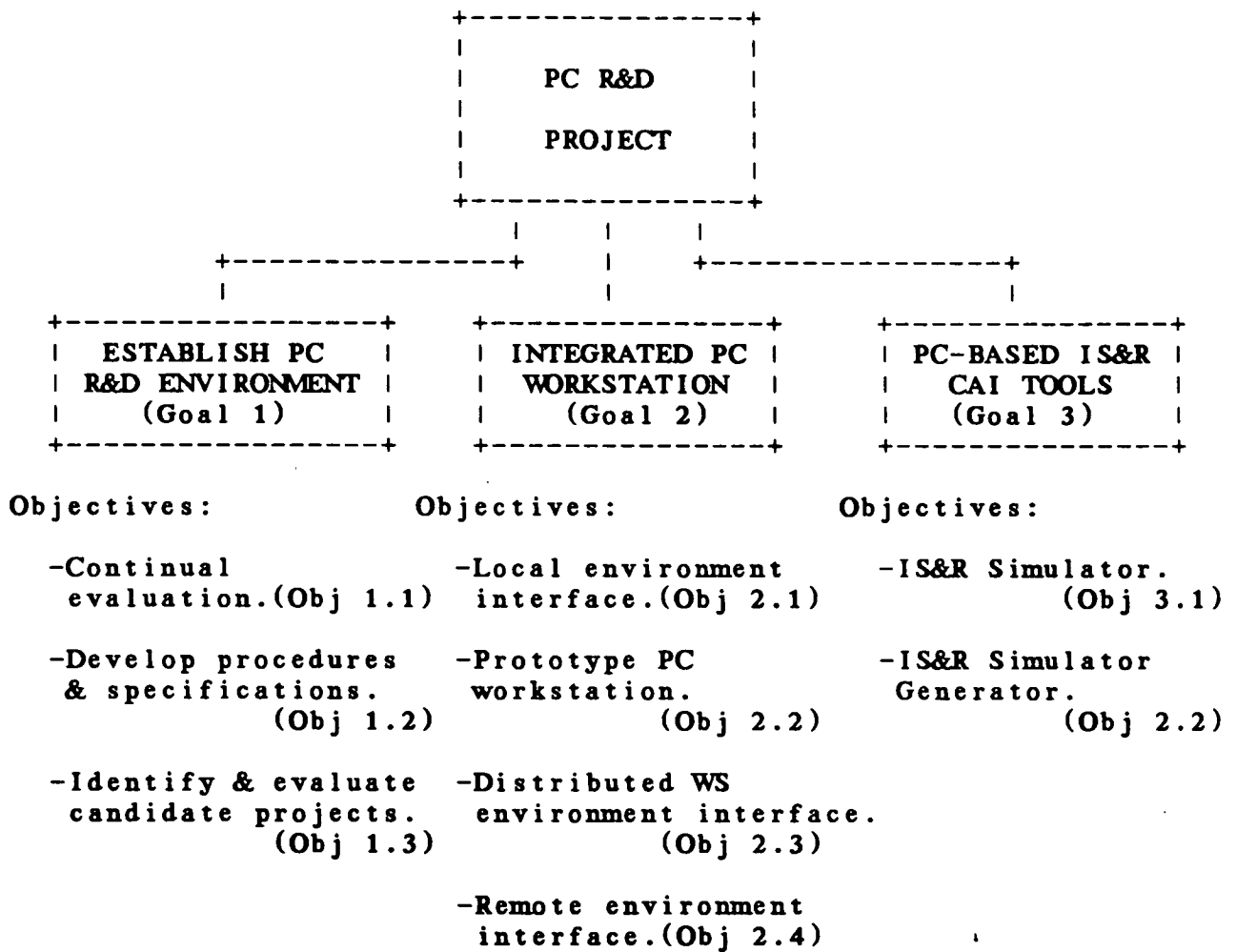
The relationships between these PC R&D goals and objectives are illustrated in the diagram on the following page.

During FY 1983-1984, considerable progress has been made in the establishment of this PC R&D environment (even though the FY 1983-1984 contract specifications did not require even addressing these issues, let alone providing formal deliverables within this area). We do, however, believe that a cost-effective distribution plan for the educational programs under development cannot be achieved without a formal support program in the PC R&D area.

Hence, we have initiated such a support program on our own as part of our strategic planning for the cost-effective implementation of the longer range educational program distribution phases of this contract work.

Progress to date within the USL PC R&D Working Paper Series (see items 5.1 through 5.8) has included tasks such as the following: PC R&D development environment standards (item 5.3); general specifications for the development of a cost-effective PC-based simulator of the NASA RECON system (item 5.4); PC-based statistical package support (item 5.5); PC-based distributed workstation specifications (item 5.6); the complete development of a PC-based interactive presentation development system for PC-controlled visual presentation sequences (item 5.7); and detailed specifications for a variety of other sub-projects within the USL PC R&D Project (item 5.8).

RELATIONSHIPS BETWEEN PC R&D GOALS AND OBJECTIVES



VI. Other Research Support Activities

A wide variety of additional research support activities have been conducted during FY 1983-1984 in support of the overall goals and objectives of the contract work.

Very briefly, these additional activities have spanned areas such as the conduct and evaluation of special NASA RECON training sessions (items 6.1 and 6.2 in the attachment); the conduct of special advanced Computer Science Department course offerings to ensure the involvement of a large body of graduate Computer Science students in the development, critique, and refinement of the educational program materials (items 6.3, 6.4, and 6.5); the establishment of an effective R&D support environment on the MULTICS computing system (item 6.6); the complete development of a series of machine-readable bibliographic data bases to support the research efforts of the contract team (items 6.7, 6.8, and 6.9); and the complete development of a MULTICS workbench to provide an integrated set of automated tools for use by the course materials development contract team (item 6.10).

SUMMARY

FY 1983-1984 has been characterized by the establishment of an extremely strong foundation, R&D environment and contract team for the conduct of all subsequent phases of the contract work, and by the development of a massive number of very high quality deliverables pursuant to the educational programs and their required PC R&D supportive activities.

We look forward to the continued development and evolution of these activities throughout the subsequent phases of this contract work.

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PART I. PROJECT MANAGEMENT AND CONTROL DOCUMENTS

1.1 USL NASA TASKS/STATUS PROJECT MANAGEMENT AND CONTROL
REPORT, 17p.

The primary project management and control report being utilized at USL for project task/status assignment, monitoring, and management. Report identifies tasks and status via task number, task status, responsible party, date identified, date completed, milestone date, and task description.

1.2 SU NASA TASKS/STATUS PROJECT MANAGEMENT AND CONTROL
REPORT, 8p.

The primary project management and control report being utilized at SU for project task/status assignment, monitoring, and management. Report identifies tasks and status via task number, task status, responsible party, date identified, date completed, milestone date, and task description.

PART II. NEEDS ANALYSIS PHASE DOCUMENTS

2.1 NEEDS ANALYSIS PHASE: LIST OF TARGETED INSTITUTIONS, 28p.

The list of the institutions that were targeted for surveying via distribution of the first college and university needs analysis questionnaire. Questionnaires were distributed to all entries identified on this list.

2.2 NEEDS ANALYSIS PHASE: QUESTIONNAIRE COVER LETTER TO TARGETED INSTITUTIONS, 2p.

The cover letter distributed to the targeted institutions together with the first college and university needs analysis questionnaire itself in order to overview the intent of the needs analysis phase of the contract and introduce the questionnaire to the surveyed community.

2.3 NEEDS ANALYSIS PHASE: NEEDS ANALYSIS QUESTIONNAIRE, 6p.

The first college and university needs analysis questionnaire distributed to the targeted institutions. The questionnaire addressed information about the universities, information storage and retrieval system usage, information storage and retrieval system educational needs, information storage and retrieval system educational courses, and comments sections.

2.4 NEEDS ANALYSIS PHASE: NEEDS ANALYSIS QUESTIONNAIRE RESULTS, 24p.

The results of the first college and university needs analysis questionnaire. This document contains all descriptive statistics for all questions, basic correlation analysis, all respondents' comments, and results interpretation sections.

PART III. COURSE DEVELOPMENT PHASE DOCUMENTS

3.1 COURSE DEVELOPMENT PHASE: STANDARDIZED COURSE MATERIAL DOCUMENTATION TEMPLATES, 5p.

The set of standardized course material documentation templates for each of the following course materials: course syllabi, lesson plans, homework assignments, homework assignment answer keys, usage assignments, usage assignment answer keys, examinations, and examination answer keys.

3.2 COURSE DEVELOPMENT PHASE: COURSE DEVELOPMENT STANDARDS FOR VISUALS OUTLINES, 6p.

The set of development and documentation standards for preparing outlines for course visuals.

3.3 COURSE DEVELOPMENT PHASE: COURSE DEVELOPMENT STANDARDS FOR VISUALS, 12p.

The set of development and documentation standards for preparing course visuals.

3.4 COURSE DEVELOPMENT PHASE: FIRST DRAFT OF PROPOSED INTEGRATED OUTLINE OF COURSE VISUALS, 15p.

The first draft of the proposed integrated outline of the system-independent course visuals associated with a full semester course offering.

3.5 COURSE DEVELOPMENT PHASE: FIRST DRAFT OF PROPOSED COURSE VISUALS, 490p.

The first draft of the proposed system-independent course visuals associated with a full semester course offering.

3.6 COURSE DEVELOPMENT PHASE: FIRST DRAFT OF PROPOSED COURSE LESSON PLANS, 146p.

The first draft of the proposed course lesson plans associated with a full semester course offering.

3.7 COURSE DEVELOPMENT PHASE: FIRST DRAFT OF PROPOSED COURSE HOMEWORK ASSIGNMENTS AND ANSWER KEYS, 47p.

The first draft of the proposed course homework assignments and answer keys associated with a full semester course offering.

3.8 COURSE DEVELOPMENT PHASE: FIRST DRAFT OF PROPOSED COURSE
NASA RECON USAGE ASSIGNMENTS, 32p.

The first draft of the proposed course NASA RECON usage assignments associated with a full semester course offering.

PART IV. WORKING PAPER SERIES DOCUMENTS

4.1 USL/DBMS NASA/RECON WORKING PAPER SERIES STANDARDS, 36p.

The full set of standards for the development, formatting, reviewing, and issuance of entries within the USL/DBMS NASA/RECON Working Paper Series.

4.2 "OVERVIEW OF THE NASA/RECON EDUCATIONAL, RESEARCH, AND DEVELOPMENT ACTIVITIES OF THE COMPUTER SCIENCE DEPARTMENTS OF THE UNIVERSITY OF SOUTHWESTERN LOUISIANA AND SOUTHERN UNIVERSITY," WAYNE D. DOMINICK, USL/DBMS NASA/RECON WORKING PAPER SERIES REPORT NUMBER DBMS.NASA/RECON-1, 9p.

An introduction to the USL/DBMS NASA/RECON Working Paper Series which has been established to provide a foundation for a formal information dissemination mechanism concerning activities being performed pursuant to the NASA/RECON contract. This entry also serves as an index into the collection of Working Paper Series reports.

4.3 "NASA RECON: COURSE DEVELOPMENT, ADMINISTRATION, AND EVALUATION," WAYNE D. DOMINICK AND LEROY ROQUEMORE, USL/DBMS NASA/RECON WORKING PAPER SERIES REPORT NUMBER DBMS.NASA/RECON-2, 65p.

Working Paper Series entry representing the scope of the initial contract proposal to NASA.

4.4 "TRANSPORTABLE, UNIVERSITY-LEVEL EDUCATIONAL PROGRAMS IN INTERACTIVE INFORMATION STORAGE AND RETRIEVAL SYSTEMS,"

WAYNE D. DOMINICK AND LEROY ROQUEMORE, USL/DEMS NASA/RECON
WORKING PAPER SERIES REPORT NUMBER DEMS.NASA/RECON-3, 16p.

Working Paper Series entry representing the abstract and visuals associated with the above named presentation delivered at the 11th Annual Conference of the Mid-South Association for Educational Data Systems. This presentation overviewed the educational aspects of the NASA contract activities.

- 4.5 "THE MAN/MACHINE INTERFACE IN INFORMATION RETRIEVAL: PROVIDING ACCESS TO THE CASUAL USER," MARTIN GRANIER, USL/DEMS NASA/RECON WORKING PAPER SERIES REPORT NUMBER DEMS.NASA/RECON-4, 69p.

Working paper series report surveying the state-of-the-art in high level man/machine interfaces for supporting casual user access to interactive information storage and retrieval systems. Additionally, capabilities and characteristics of selected specific systems are addressed within the report, including LEXIS, CONIT, IIDA, CITE, and CCL.

- 4.6 "KNOWLEDGE-BASED SYSTEMS: A PRELIMINARY SURVEY OF SELECTED ISSUES AND TECHNIQUES," SRINU KAVI, USL/DEMS NASA/RECON WORKING PAPER SERIES REPORT NUMBER DEMS.NASA/RECON-5, 102p.

Working paper series report surveying the state-of-the-art in knowledge-based systems (expert systems), including issues related to knowledge representation, knowledge bases, cognitive engine strategies, user interfaces for knowledge-based systems, and application considerations.

- 4.7 "CONCEPTS AND IMPLEMENATIONS OF NATURAL LANGUAGE QUERY SYSTEMS," I-HSIUNG LIU, USL/DEMS NASA/RECON WORKING PAPER SERIES REPORT NUMBER DEMS.NASA/RECON-6, 46p.

Working paper series report surveying the state-of-the-art in natural language query systems for information systems, including issues related to hierarchies of user languages, query language analyzers, dialog controllers, and synthesizers, and implementation considerations for natural language query systems.

PART V. PC R&D SPECIFICATIONS DOCUMENTS AND
PC R&D WORKING PAPER SERIES DOCUMENTS

- 5.1 "AN OVERVIEW OF THE USL/DBMS NASA/PC R&D PROJECT WORKING PAPER SERIES," WAYNE D. DOMINICK, USL/DBMS NASA/PC R&D WORKING PAPER SERIES REPORT NUMBER DBMS.NASA/PC R&D-1, 6p.

An introduction to the USL/DBMS NASA/PC R&D Working Paper Series which has been established to provide a foundation for both a formal and informal information dissemination mechanism concerning PC-based research and development activities being performed pursuant to the NASA contract. This entry also serves as an index into the collection of Working Paper Series reports.

- 5.2 "THE USL NASA PC R&D PROJECT: GENERAL SPECIFICATIONS OF OBJECTIVES," WAYNE D. DOMINICK, USL/DBMS NASA/PC R&D WORKING PAPER SERIES REPORT NUMBER DBMS.NASA/PC R&D-2, 6p.

The general specifications of the objectives of the USL/DBMS NASA PC R&D Project, a Research and Development Project initiated at USL in order to address future R&D issues related to the PC-based processing environments acquired pursuant to the NASA contract work, namely, the IBM PC/XT systems.

- 5.3 "THE USL NASA PC R&D DEVELOPMENT ENVIRONMENT STANDARDS," DENNIS R. MOREAU, USL/DBMS NASA/PC R&D WORKING PAPER SERIES REPORT NUMBER DBMS.NASA/PC R&D-3, 8p.

The development environment standards which have been established in order to control usage of the IBM PC/XT development systems and to prevent interference between projects being concurrently developed on the PC's. The standards address the following areas: scheduling PC resources; login/logout procedures; training; file naming conventions; hard disk organization; diskette care; backup procedures; and copying policies.

- 5.4 "GENERAL SPECIFICATIONS FOR THE DEVELOPMENT OF A PC-BASED SIMULATOR OF THE NASA RECON SYSTEM," SPIROS TRIANTAFYLLOPOULOS, USL/DEMS NASA/PC R&D WORKING PAPER SERIES REPORT NUMBER DEMS.NASA/PC R&D-4, 21p.

The general specifications for the design and implementation of an IBM PC/XT-based simulator of the NASA RECON system, including record designs, file structure designs, command language analysis, program design issues, error recovery considerations, and usage monitoring facilities. Once implemented, such a simulator will be utilized to evaluate the effectiveness of simulated information system access in addition to actual system usage as part of the total educational programs being developed within the NASA contract.

- 5.5 "GENERAL SPECIFICATIONS FOR THE DEVELOPMENT OF A USL NASA PC R&D STATISTICAL ANALYSIS SUPPORT PACKAGE," JINOUS BASSARI AND SPIROS TRIANTAFYLLOPOULOS, USL/DEMS NASA/PC R&D WORKING PAPER SERIES REPORT NUMBER DEMS.NASA/PC R&D-5, 14p.

The USL NASA PC R&D statistical analysis support package is designed to be a three level package to allow statistical analysis for a variety of applications within the USL DEMS NASA Contract work. The design addresses usage of the statistical facilities as a library package, as an interactive statistical analysis system, and as a batch processing package.

- 5.6 "GENERAL SPECIFICATIONS FOR THE DEVELOPMENT OF A USL NASA PC R&D DISTRIBUTED WORKSTATION," FRANK Y. CHUM, USL/DEMS NASA/PC R&D WORKING PAPER SERIES REPORT NUMBER DEMS.NASA/PC R&D-6, 10p.

This document defines the general specifications for the development of a PC-Based distributed workstation (PCDWS) for an information storage and retrieval systems environment. This research proposes the development of a PCDWS prototype as part of the USL/DEMS NASA/PC R&D project in the PC-Based workstation environment.

- 5.7 "THE USL NASA PC R&D INTERACTIVE PRESENTATION DEVELOPMENT SYSTEM," DENNIS R. MOREAU, USL/DEMS NASA/PC R&D WORKING PAPER SERIES REPORT NUMBER DEMS.NASA/PC R&D-7, 8p.

The Interactive Presentation Development System (IPDS) is a highly interactive system for creating, editing, and displaying video presentation sequences, e.g., for developing and presenting displays of instructional material similar to overhead transparency or slide presentations. However, since this system is PC-based, users (e.g., instructors) can step through sequences forward or backward, focusing attention to areas of the display with special cursor pointers. Additionally, screen displays may be dynamically modified during the presentation to show assignments or to answer questions, much like a traditional blackboard. This system is now implemented at USL for use within the piloting phases of the NASA contract work.

- 5.8 "THE USL NASA PC R&D PROJECT: DETAILED SPECIFICATIONS OF OBJECTIVES," FRANK Y. CHUM, PHILIP P. HALL, DENNIS R. MOREAU, AND SPIROS TRIANTAFYLLOPOULOS, USL/DEMS NASA/PC R&D WORKING PAPER SERIES REPORT NUMBER DEMS.NASA/PC R&D-8, 21p.

This document represents the specifications for a number of projects which are to be implemented within the USL NASA PC R&D Project. The goals and objectives of the PC development project and the interrelationships of the various components are discussed. Six individual projects are described. They are a NASA/RECON simulator, a user interface to multiple remote information systems, evaluation of various personal computer systems, statistical analysis software development, interactive presentation system development, and the development of a distributed processing environment. The relationships of these projects to each other and to the goals and objectives of the overall project are also discussed.

PART VI. OTHER RESEARCH SUPPORT DOCUMENTS

- 6.1 NASA/RECON SPECIAL TRAINING WORKSHOP AT USL: WORKSHOP AGENDA, LIST OF PARTICIPANTS, AND COMPLETION CERTIFICATES, 4p.

The workshop agenda, list of participants, and a sample copy of the completion certificate associated with the NASA/RECON Special Training Workshop held at USL, January 31, 1984 - February 2, 1984.

- 6.2 NASA/RECON SPECIAL TRAINING WORKSHOP AT USL: PARTICIPANTS EVALUATION FORM SUMMARY RESULTS, 10p.

The summary statistical evaluation results and participants comments associated with the evaluation of the NASA/RECON Special Training Workshop held at USL, January 31, 1984 - February 2, 1984.

- 6.3 USL COMPUTER SCIENCE DEPARTMENT COURSE CMPS669 "ADVANCED TOPICS IN COMPUTER-BASED INFORMATION SYSTEMS (NASA RECON)" COURSE SYLLABUS, SPRING 1984, 7p.

Syllabus for a graduate course offered at USL during the Spring Semester 1984 pursuant to additional student input into, and involvement in the NASA contract educational activities.

- 6.4 USL CMPS669 STUDENT TASKS/ASSIGNMENTS TASKING SPECIFICATIONS DOCUMENT: SPRING SEMESTER, 1984, 10p.

Specification of specific tasks being addressed by students enrolled in the aforementioned CMPS669 course offered at USL during the Spring Semester 1984.

6.5 USL CMPS669 STUDENT TASKS/ASSIGNMENTS TASKING SPECIFICATIONS
DOCUMENT: SUMMER SEMESTER, 1984, 11p.

Specifications of specific tasks being addressed by students participating in a second graduate information systems course (CMPS669) at USL during the Summer Semester 1984 pursuant to additional student input into, and involvement in the NASA contract educational activities.

6.6 USL DEMS R&D PROJECT NASA/RECON MULTICS DIRECTORY
STRUCTURE, 28p.

Identification of the automated directory structure which has been established on the USL MULTICS system, under the auspices of the Computer Science Department's DEMS R&D Project, in order to provide automated support for the educational, research and development tasks being addressed within the scope of the NASA/RECON contract.

6.7 USL DEMS NASA/RECON BIBLIOGRAPHIC SUPPORT DATA BASE
STATUS, 33p.

The status of a bibliographic support data base which has been created at USL in order to provide local searchable access to all files being maintained and utilized as part of the NASA/RECON contract activities.

6.8 USL DEMS IS&R BIBLIOGRAPHIC SUPPORT DATA BASE STATUS, 139p.

The status of a bibliographic support data base which has been created at USL in order to provide local searchable access to the primary information storage and retrieval literature (books, journal articles, conference proceedings, technical reports, government reports, and so on) being utilized by the NASA contract team pursuant to the development of all educational materials.

6.9 USL DEMS PME BIBLIOGRAPHIC SUPPORT DATA BASE STATUS, 47p.

The status of a bibliographic support data base which has been created at USL in order to provide local searchable access to the primary information system performance measurement and evaluation literature (books, journal articles, conference proceedings, technical reports, government reports, and so on) being utilized by the NASA contract team pursuant to the development of all educational materials.

6.10 USL/DEMS NASA/RECON MULTICS WORKBENCH SPECIFICATIONS, 6p.

The specifications of an R&D workbench to be implemented on the USL MULTICS system in order to provide centralized control over, and access to all contract work being performed utilizing the MULTICS system as the host processing environment. Versions 1 and 2 of the MULTICS workbench, providing centralized menu control, project management and control report generation, mailing list processors, electronic mail processors, document pre- and post-processors including laser printer format generators, tape backup processors, NASA RECON data base document control processors, and access control have been completely implemented, tested, and are in operational status. Further enhancements to the workbench are currently in design stages.

ATTACHMENT 1.1

**USL NASA TASKS/STATUS PROJECT
MANAGEMENT AND CONTROL REPORT**

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O: 01/16/84
R: 08/28/84

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TASK NUMBER	TASK STATUS	RESPONSIBLE PARTY	DATE IDENTIFIED	DATE COMPLETED	MILESTONE DATE	TASK DESCRIPTION
1.	COMPLETED	WDD	12/08/83	01/02/84	01/16/84	Establish Contract R&D Team (RA's/Graduate Students).
2.	COMPLETED	WDD	01/02/84	01/14/84	01/16/84	Establish Structure for Primary Team (WDD/FYC/ST) Interaction/Meetings.
3.	COMPLETED	WDD	01/02/84	01/13/84	01/16/84	Establish Structure for Secondary Team (Other Graduate Students) Interaction/Meetings = CMPS669.
4.	COMPLETED	WDD	01/02/84	01/13/84	01/16/84	Prepare Initial Contract Material/Handouts for all Team Members.
5.	COMPLETED	WDD	01/14/84	01/17/84	02/01/84	Prepare CMPS669 Student Tasks/Assignments.
6.	COMPLETED	ST	01/02/84	01/25/84	01/25/84	Define/Populate MADAM Data Base for Primary Contract Reference Materials.
7.	COMPLETED	WDD	01/14/84	01/25/84	02/01/84	Schedule NASA/RECON Training Workshop at USL.
8.	COMPLETED	WDD	01/14/84	01/16/84	02/01/84	Establish Structure for USL/DBMS NASA/RECON Working Paper Series.
9.	COMPLETED	WDD	12/16/84	02/20/84	02/23/84	Prepare Contract Presentation for AEDS Conference February 23-25, 1984, New Orleans, LA.
10.	COMPLETED	WDD	12/16/84	02/20/84	04/01/84	Prepare Contract Presentation for John Willson, NASA, HQ, for National Online Meeting, April 1984, New York, NY.
11.	COMPLETED	WDD/JW	01/17/84	06/19/84	04/30/84	Requested System Documentation from John Willson, NASA, HQ, for the Following Additional Candidate Systems: DOE/RECON, DOD/DROLS.

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TASK NUMBER	TASK STATUS	RESPONSIBLE PARTY	DATE IDENTIFIED	DATE COMPLETED	MILESTONE DATE	TASK DESCRIPTION
12.	COMPLETED	IHL/CAP/KST	01/14/84	08/01/84	07/27/84	Define/Populate MADAM Data Base for Full NASA/CMPS669 Library and Reading Materials/Reference Materials.
13.	COMPLETED	WDD	01/14/84	04/30/84	05/01/84	Initially Proposed Budget Analysis/Planning/Revision as Necessary.
14.	COMPLETED	WDD	01/14/84	08/20/84	09/10/84	Initially Proposed Schedule Analysis/Planning/Revision Revised Proposed Schedule to John Wilson, NASA, HQ, as Necessary. To be Incorporated into Revised Proposal for Second Year of Contract Work.
15.	COMPLETED	ST/FYC	01/14/84	04/06/84	04/09/84	Equipment Analysis/Recommendations: PC's vs. Terminals.
16.	COMPLETED	WDD	01/17/84	04/23/84	04/30/84	Equipment Acquisition Approvals from NASA, HQ.
17.	COMPLETED	WDD/ST/FYC/DM	01/17/84	06/22/84	06/15/84	Equipment Acquisition/Installation/Operational Testing.
18.	COMPLETED	WDD/JW	01/17/84	04/10/84	04/06/84	Needs Analysis Phase: Identify Target Institutions.
19.	COMPLETED	CAP/WCY	01/17/84	04/10/84	04/06/84	Needs Analysis Phase: Develop Survey Mailing List.
20.	COMPLETED	MSK/MG/WDD	01/17/84	03/20/84	03/30/84	Needs Analysis Phase: Develop Needs Analysis Questionnaire.
21.	COMPLETED	WDD	01/17/84	04/11/84	04/06/84	Needs Analysis Phase: Survey Target Institutions.
22.	COMPLETED	SK/MSK/SEM	01/17/84	06/26/84	06/26/84	Needs Analysis Phase: Analyze/Document Questionnaire Results.
23.	COMPLETED	WDD/PH/MG/SG	01/17/84	08/13/84	08/30/84	Needs Analysis Phase: Evaluate Phase Activities.
24.	COMPLETED	WDD	01/17/84	08/13/84	09/10/84	Needs Analysis Phase: NASA Interim Report No. 2. To be Incorporated into Final Report of FY83-84 Contract Work.
25.	ASSIGNED	WDD/FYC/ST	01/14/84	-----	-----	Contract R&D Team and CMPS669 Students Field Trip to NASA Johnson Space Center, Houston, TX.

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TASK NUMBER	TASK STATUS	RESPONSIBLE PARTY	DATE IDENTIFIED	DATE COMPLETED	MILESTONE DATE	TASK DESCRIPTION
26.	COMPLETED	WDD	01/14/84	02/20/84	02/10/84	Prepare Formal Specifications of Planned CMPS669 Deliverables.
27.	-----	FYC/ST	01/17/84	-----	-----	Develop USL/DBMS/NASA Logo for LASER Printer Output.
28.	-----	WDD/FYC/ST	01/17/84	-----	-----	Develop PC Simulator Contract Proposal Targeted to Jack Kolb, DoD.
29.	COMPLETED	WDD	11/14/83	05/15/84	06/01/84	Develop Plans for Follow-on Contract Proposals to Incorporate the Following Systems into the Contract Work: DIALOG, SDC, BRS, DOE/RECON, DOD/DROLS, EPA/CSIN, LLL/TIS/IGS.
30.	COMPLETED	CMPS669	01/14/84	04/30/84	05/01/84	Identify Research-Oriented Topics/Projects (M.Sc. & Ph. D. Levels) Relevant to Course Work.
31.	COMPLETED	CMPS669	01/14/84	04/30/84	05/01/84	Develop Long-Range Plans for Contract Work and Future Work after Termination of Spring Semester CMPS669.
32.	COMPLETED	CMPS669	01/16/84	04/30/84	05/01/84	Course Development Phase: Develop Course Visuals: First Draft.
33.	COMPLETED	CMPS669	01/16/84	04/30/84	05/01/84	Course Development Phase: Develop Lesson Plans: First Draft.
34.	COMPLETED	CMPS669	01/16/84	04/30/84	05/01/84	Course Development Phase: Develop Homework Assignments and Answer Keys: First Draft.
35.	COMPLETED	CMPS669	01/16/84	04/30/84	05/01/84	Course Development Phase: Develop RECON Usage Assignments and Answer Keys First Draft.
36.	ASSIGNED	MG/CMPS669	01/16/84	-----	08/20/84	Course Development Phase: Develop Examinations and Answer Keys: First Draft.
37.	COMPLETED	WDD/ST	01/18/84	02/20/84	02/23/84	After Completion of NASA RECON Workshop at USL, Provide Feedback to John Wilson, NASA, HQ, and to Philip Eckert, NASA, STI on Quality/Appropriateness of the Intensive Workshop.

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38.	COMPLETED	WDD/PE	01/18/84	01/24/84	01/31/84	Obtain 15 Additional Copies of the RECON User's Manual and Pocket Guides from Philip Eckert.
39.	COMPLETED	WDD/JW	01/18/84	02/10/84	02/10/84	Obtain NASA Computer Configuration and Computer Network Schematics for Use in AEDS Presentation and National Online Meeting Presentation from John Wilson, NASA, HQ.
40.	COMPLETED	ST	01/18/84	01/30/84	01/30/84	Prepare List of Names, Positions, Titles, Affiliations, Telephone Numbers of all Attendees at NASA/RECON Workshop to be Held at USL.
41.	ASSIGNED	WDD	01/18/84	-----	-----	Prepare Publicity for USL Involvement in the NASA Contract.
42.	COMPLETED	SM/CAP/PH	01/19/84	06/26/84	06/15/84	Implement Multics DBMS and CMPS669 Directory Backup and Save Tape Periodic and On-Demand Absentee Processes.
43.	COMPLETED	WDD/ST/FYC	01/19/84	03/29/84	03/30/84	NASA Multics Workbench: Develop Specifications.
44.	COMPLETED	SM/CAP/PH	01/19/84	06/26/84	06/15/84	NASA Multics Workbench: Design, Implementation, Testing Operational Usage: Version 1.
45.	COMPLETED	WDD	01/20/84	01/22/84	01/30/84	USL/DBMS NASA Working Paper Series: Write Editorial Introductions.
46.	COMPLETED	WDD	01/20/84	02/29/84	02/23/84	USL/DBMS NASA Working Paper Series: Write Overview Entry DBMS.NASA/RECON-1.
47.	COMPLETED	FYC	01/20/84	02/29/84	02/10/84	Develop LASER Printer Control Segments for High Quality Printing of all NASA Documentation in Preparation for Dissemination to John Wilson, NASA, HQ.
48.	COMPLETED	WDD	01/21/84	01/22/84	01/30/84	Prepare First USL Progress/Status Report to Leroy Roquemore Southern University, on the USL Progress on the Contract Work.

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49.	COMPLETED	FYC	01/24/84	02/08/84	02/08/84	Develop NASA/RECON Workshop Participant Evaluation Form for Follow-up Evaluation of Workshop to be Held at USL.
50.	COMPLETED	FYC	01/24/84	03/12/84	03/01/84	Develop NASA Working Paper Series Reviewer/Evaluation Form for Submitted entries.
51.	COMPLETED	FYC	01/25/84	03/19/84	03/01/84	Develop NASA Working Paper Series Documentation Standards.
52.	COMPLETED	FYC	01/25/84	02/01/84	02/01/84	Prepare NASA Workshop Completion Certificates through the USL Print Shop.
53.	COMPLETED	WDD	01/16/84	01/16/84	01/30/84	USL/DBMS NASA Working Paper Series: Write Proposal Entry: DBMS.NASA/RECON-2.
54.	COMPLETED	WDD	01/25/84	01/27/84	01/30/84	USL/DBMS NASA Working Paper Series: Write AEDS Foils Entry DBMS.NASA/RECON-3.
55.	COMPLETED	FYC	01/29/84	02/10/84	02/08/84	Prepare LASER Printer Final Version of Foils for the AEDS Conference Contract Presentation.
56.	COMPLETED	WDD/PE	01/18/84	02/02/84	02/02/84	Conduct NASA/RECON Workshop at USL: 01/31/84-02/02/84.
57.	COMPLETED	WDD	02/01/84	02/07/84	02/10/84	Prepare/Disseminate Thank You Letters to all NASA Instructors and All USL and SU Participants at the NASA/RECON Workshop at USL.
58.	COMPLETED	ST	02/02/84	02/20/84	02/10/84	Update MADAM NASA/RECON Data Base With NASA/RECON Workshop Entries.
59.	COMPLETED	WDD	02/10/84	02/29/84	03/01/84	Complete and Distribute First Interim Report to John Wilson, NASA, HQ.
60.	-----	-----	02/29/84	-----	-----	Consider Preparing Special Contract NASA/USL/SU Letterhead.
61.	COMPLETED	WDD/MG/PH	02/29/84	03/14/84	03/14/84	Obtain USL Graduate Student Organization Funding for Two CMPS669 Students to Access IS&R Systems in Addition to the NASA/RECON System.

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TASK NUMBER	TASK STATUS	RESPONSIBLE PARTY	DATE IDENTIFIED	DATE COMPLETED	MILESTONE DATE	TASK DESCRIPTION
62.	COMPLETED	ST/KST	03/10/84	06/19/84	06/15/84	Update MADAM NASA/RECON Data Base with all Working Paper Series Entries, NASA USL Status Reports to SU, Volume I, and USL/SU Interim Report Number 1 to NASA.
63.	COMPLETED	MG/FYC/WDD	03/12/84	05/29/84	06/01/84	Complete USL/DBMS NASA/RECON Working Paper Series Entry DBMS.NASA/RECON-4, Entitled "The Man/Machine Interface in Information Retrieval: Providing Access to the Casual User".
64.	COMPLETED	SK/WDD	03/12/84	05/31/84	06/01/84	Complete USL/DBMS NASA/RECON Working Paper Series Entry DBMS.NASA/RECON-5, Entitled "Knowledge-Based Systems: Issues and Techniques".
65.	COMPLETED	IHL/WDD	03/12/84	06/01/84	06/01/84	Complete USL/DBMS NASA/RECON Working Paper Series Entry DBMS.NASA/RECON-6, Entitled "Concepts and Implementation of Natural Language Query Systems".
66.	DEFERRED	WCY	03/12/84	-----	-----	Complete USL/DBMS NASA/RECON Working Paper Series Entry DBMS.NASA/RECON-X, Entitled "Selected Database Security Technologies for DataBase Systems".
67.	DEFERRED	ST/FYC/DM	03/12/84	-----	-----	Complete USL/DBMS NASA/RECON Working Paper Series Entry DBMS.NASA/RECON-7, Entitled "USL NASA/RECON Contract Equipment Analysis/Selection Process".
68.	COMPLETED	WCY/KST	03/12/84	08/01/84	07/27/84	Define/Populate MADAM Data Base for NASA Information System Performance Measurement and Evaluation and Reading Materials/Reference Materials Library.
69.	COMPLETED	WDD/SG/IHL	03/19/84	04/11/84	04/11/84	Obtain USL Graduate Student Organization Funding for Two Additional CMPS669 Students to Access IS&R Systems in Addition to the NASA/RECON System.

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TASK NUMBER	TASK STATUS	RESPONSIBLE PARTY	DATE IDENTIFIED	DATE COMPLETED	MILESTONE DATE	TASK DESCRIPTION
70.	-----	-----	03/27/84	-----	-----	Needs Analysis Phase: Determine Desirability of Distributing Second Version of Needs Analysis Questionnaire Targeted at Science Disciplines Other Than Physical Sciences, e.g., Life Sciences, Medical Sciences, Behavioral Sciences, Managerial Sciences, etc.
71.	COMPLETED	ST/SK	03/27/84	05/30/84	05/15/84	Needs Analysis Phase: Define Specifications, Questionnaire File Structure, Statistical Analysis Package Identification and Other Tasks Preparatory to Analyzing/Documenting the Questionnaire Data/Results.
72.	COMPLETED	WDD	03/28/84	05/11/84	06/01/84	Equipment Installation: Identify/Obtain Facilities to House Procured Equipment.
73.	COMPLETED	WDD	04/02/84	04/24/84	05/01/84	Develop Specific Computer Science Department Course Offering for Supporting Continued Student Participation in Contract Work During the Summer, 1984.
74.	COMPLETED	WDD	04/05/84	04/16/84	04/30/84	Distribute Copy of First Interim Report to Jack Kolb, DoD.
75.	COMPLETED	WDD/ST	04/05/84	04/06/84	04/09/84	Complete and Distribute Alternate Equipment Selection Proposal to John Wilson, NASA, HQ and to SU.
76.	COMPLETED	FYC/ST/WDD	04/05/84	04/09/84	04/09/84	Course Development Phase: Develop Integrated Outline of Course Visuals From Individual CMPS669 Student Outlines: First Draft.
77.	-----	-----	04/09/84	-----	-----	Needs Analysis Phase: Determine Desirability of Distributing Third Version of Needs Analysis Questionnaire Targeted at Prospective Employers, e.g., NASA Space Centers, NASA Research Centers NASA Contractors, etc.
78.	COMPLETED	WDD	04/10/84	08/28/84	09/10/84	Revise Proposal for Second Year of Contract Work and Submit to John Wilson, NASA, HQ.

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TASK NUMBER	TASK STATUS	RESPONSIBLE PARTY	DATE IDENTIFIED	DATE COMPLETED	MILESTONE DATE	TASK DESCRIPTION
79.	COMPLETED	WDD/ST/KN/ARS	04/13/84	04/25/84	04/25/84	Obtain USL Graduate Student Organization Funding for Three Additional CMPS669 Students to Access IS&R Systems in Addition to the NASA/RECON System.
80.	COMPLETED	WDD	04/10/84	06/04/84	06/01/84	Determine Desirability and Time Availability for WDD to Define, Organize, and Chair a NASA Contract-Related Session at the Eighteenth Annual Hawaii International Conference on Systems Sciences, to be Held in Honolulu, Hawaii, January 2-4, 1985.
81.	COMPLETED	WDD/LR	04/25/84	06/12/84	06/15/84	Resolution of Budget Reallocations Between USL and SU.
82.	REQUESTED	WDD/JW	04/30/84	-----	07/01/84	Resolution of Protocols for USL Access to NASA Supercomputers.
83.	COMPLETED	WDD/JW	04/30/84	05/29/84	07/01/84	Resolution of Potential No-Cost USL Access to NASA/RECON.
84.	REQUESTED	WDD/JW	04/30/84	-----	07/01/84	Obtain NASA Space Station R&D Documents from John Wilson, NASA, HQ.
85.	DEFERRED	-----	04/30/84	-----	-----	Modify Contract Documentation Standards and Documents in Progress to Reflect University Name Change: USL to UL.
86.	COMPLETED	WDD/RA TEAM	04/30/84	05/29/84	06/01/84	Prepare Formal Specifications of Planned Summer CMPS669 Deliverables.
87.	COMPLETED	WDD/RA TEAM	04/30/84	05/29/84	06/01/84	Prepare Formal Tasking Document for Summer CMPS669 Participants.
88.	COMPLETED	SG/CMPS669	04/30/84	08/16/84	08/12/84	Course Development Phase: Develop Course Visuals: Second Draft.
89.	COMPLETED	MG/SG/MSK	04/30/84	08/23/84	08/01/84	Course Development Phase: Develop Lesson Plans: Second Draft.
90.	COMPLETED	MG/CMPS669	04/30/84	08/16/84	08/12/84	Course Development Phase: Develop Homework Assignments and Answer Keys Second Draft.

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91.	COMPLETED	MG/CMPS669	04/30/84	08/16/84	08/12/84	Course Development Phase: Develop RECON Usage Assignments and Answer Keys: Second Draft.
92.	COMPLETED	WDD/RA TEAM	04/30/84	07/31/84	06/30/84	Determine Exact Expenditures for GSO Funded Allocations.
93.	ASSIGNED	WDD/SG	05/01/84	-----	-----	Develop Contract Proposal to Incorporate Additional Systems into the Contract Work: DOE/RECON.
94.	ASSIGNED	WDD/KHN	05/01/84	-----	-----	Develop Contract Proposal to Incorporate Additional Systems into the Contract Work: DOD/DROLS.
95.	ASSIGNED	WDD/MG	05/01/84	-----	-----	Develop Contract Proposal to Incorporate Additional Systems into the Contract Work: DIALOG.
96.	ASSIGNED	WDD/MG	05/01/84	-----	-----	Develop Contract Proposal to Incorporate Additional Systems into the Contract Work: SDC.
97.	ASSIGNED	WDD/MG	05/01/84	-----	-----	Develop Contract Proposal to Incorporate Additional Systems into the Contract Work: BRS.
98.	ASSIGNED	WDD/PH	05/01/84	-----	-----	Develop Contract Proposal to Incorporate Additional Systems into the Contract Work: EPA/CSIN.
99.	ASSIGNED	WDD/FYC	05/01/84	-----	-----	Develop Contract Proposal to Incorporate Additional Systems into the Contract Work: LLL/TIS/IGS.
100.	COMPLETED	PH/SG	05/15/84	06/07/84	05/31/84	Conduct Extensive NASA/RECON Searches for On-Going NASA R&D Addressing the Space Station Program, PC's, User Interfaces, Microcomputer Workstations, Information System/Data Base Simulators, etc.
101.	ASSIGNED	FYC/DM	05/11/84	-----	08/10/84	Prepare System Development Standards for Systems Design, Programming, Testing, and Documentation for Use Within a C Programming Environment on the IBM PC/XT's.
102.	COMPLETED	WDD/NVN	05/31/84	08/08/84	08/01/84	Obtain Loaner PC/XT/370 for our Evaluation and for Workstation Prototyping.

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TASK NUMBER	TASK STATUS	RESPONSIBLE PARTY	DATE IDENTIFIED	DATE COMPLETED	MILESTONE DATE	TASK DESCRIPTION
103.	ASSIGNED	WDD/NVN	05/31/84	-----	-----	Consider Developing R&D Equipment Contract Proposal to IBM for Donation of PC Hardware/Software to NASA Contract Work.
104.	COMPLETED	CAP/PH	05/31/84	08/14/84	08/12/84	NASA Multics Workbench: Specifications, Design, Implementation, Testing, Operational Usage, Internal and External Workbench Documentation: Version 2.
105.	COMPLETED	WDD/JW	06/05/84	07/30/84	07/31/84	Define and Organize the NASA Contract-Related Session at HICSS-18.
106.	ASSIGNED	RA TEAM	06/05/84	-----	09/10/84	Prepare USL NASA Contract Position Paper to be Presented Within the NASA Contract-Related Session at HICSS-18.
107.	COMPLETED	WDD	06/06/84	06/06/84	06/10/84	Define General Specifications of Objectives of USL NASA PC R&D Project.
108.	COMPLETED	PC RA TEAM	06/06/84	08/14/84	07/10/84	Define Detailed Specifications of Objectives, Tasking Assignments, and Time Schedules for Tasks Within the USL NASA PC R&D Project.
109.	REQUESTED	WDD/PE	06/06/84	-----	-----	Obtain New NASA RECON User's Manuals.
110.	COMPLETED	WDD/FYC	06/06/84	06/13/84	06/30/84	Prepare Second USL Progress/Status Report to Leroy Roquemore, Southern University, on the USL Progress on the Contract Work.
111.	ASSIGNED	WDD/LR	06/06/84	-----	08/30/84	Define SU Tasks to be Performed in Support of the Contract Work.
112.	COMPLETED	WDD	06/12/84	06/27/84	08/15/84	RA & PC Office Space: Identify/Obtain Office Space to House USL Research Assistants and Procured PC Equipment from the Fall Semester, 1984 on.
113.	COMPLETED	PH/MG/SG	06/12/84	08/20/84	07/10/84	Needs Analysis Phase: Interpret Questionnaire Results and Prepare Final Documentation of Results for Dissemination to NASA and Questionnaire Respondents.

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TASK NUMBER	TASK STATUS	RESPONSIBLE PARTY	DATE IDENTIFIED	DATE COMPLETED	MILESTONE DATE	TASK DESCRIPTION
114.	COMPLETED	CMPS669	01/16/84	04/30/84	05/01/84	Course Development Phase: Develop Course Visuals Outlines: First Draft.
115.	COMPLETED	SG/CMPS669	04/30/84	08/14/84	08/12/84	Course Development Phase: Develop Course Visuals Outlines: Second Draft.
116.	REQUESTED	MG	06/19/84	-----	07/15/84	Obtain System Documentation From the System Vendors for the Following Additional Candidate Systems: DIALOG, SDC, BRS, EPA/CSIN, LLL/TIS/IGS.
117.	COMPLETED	WDD/NVN	06/13/84	07/18/84	07/15/84	IBM PC/XT Color Graphics Monitors Equipment Acquisition/Installation/Operational Testing.
118.	COMPLETED	WDD/TMW	06/13/84	06/21/84	06/30/84	RA & PC Office Space: Identify/Obtain Additional Temporary Office Space through mid-August, 1984.
119.	ASSIGNED	WDD/NVN	06/20/84	-----	08/15/84	Obtain IBM PC PC/IX Software Product on Loan from IBM for Evaluation.
120.	COMPLETED	WDD	06/20/84	06/29/84	07/15/84	Prepare Core Version of System Incorporation Proposals.
121.	COMPLETED	ST	06/15/84	06/26/84	07/03/84	NASA PC R&D Project: Prepare General Specifications for PC-Based NASA/RECON Simulator Project.
122.	COMPLETED	DM	06/15/84	07/07/84	07/10/84	NASA PC R&D Project: Prepare PC Usage/Development Environment Standards.
123.	COMPLETED	JB/ST	06/15/84	07/24/84	07/24/84	NASA PC R&D Project: Prepare General Specifications for PC-Based Statistical Analysis Support Project.
124.	COMPLETED	FYC/DM	06/15/84	08/13/84	08/01/84	NASA PC R&D Project: Prepare General and Detailed Specifications for PC-Based Distributed Workstations Project.
125.	COMPLETED	DM	06/15/84	07/31/84	07/31/84	NASA PC R&D Project: Prepare General and Detailed Specifications for PC-Based Graphics Presentation Support Project.

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TASK NUMBER	TASK STATUS	RESPONSIBLE PARTY	DATE IDENTIFIED	DATE COMPLETED	MILESTONE DATE	TASK DESCRIPTION
126.	ASSIGNED	DM/FYC/ST	06/15/84	-----	-----	NASA PC R&D Project: Prepare General and Detailed Specifications for PC-Based Knowledge-Based Systems Project.
127.	COMPLETED	DM/FYC/ST	06/15/84	08/10/84	08/01/84	NASA PC R&D Project: Prepare Comprehensive Plan for Evaluation of the IBM PC XT/370.
128.	DEFERRED	-----	06/15/84	-----	-----	NASA PC R&D Project: Prepare General and Detailed Specifications for a PC-Based IS&R Common Command Language and Common Command Language Translator.
129.	COMPLETED	WDD	07/07/84	07/07/84	07/10/84	NASA PC R&D Project: Establish Structure for USL/DBMS NASA/PC R&D Working Paper Series.
130.	COMPLETED	WDD	07/07/84	07/07/84	07/10/84	NASA PC R&D Project: Complete USL/DBMS NASA/PC R&D Working Paper Series Entry DBMS NASA/PC R&D-1. Entitled "An Overview of the USL/DBMS NASA PC R&D Project Working Paper Series".
131.	COMPLETED	WDD	07/07/84	07/07/84	07/10/84	NASA PC R&D Project: Complete USL/DBMS NASA/PC R&D Working Paper Series Entry DBMS NASA/PC R&D-2. Entitled, "The USL NASA PC R&D Project: General Specifications of Objectives".
132.	COMPLETED	DM	07/07/84	07/31/84	07/10/84	NASA PC R&D Project: Complete USL/DBMS NASA/PC R&D Working Paper Series Entry DBMS NASA/PC R&D-3. Entitled "The USL NASA PC R&D Development Environment Standards".
133.	COMPLETED	ST	07/10/84	08/02/84	08/15/84	NASA PC R&D Project: Complete USL/DBMS NASA/PC R&D Working Paper Series Entry DBMS NASA/PC R&D-4. Entitled "General Specifications for the Development of a PC-Based Simulator of the NASA RECON System".
134.	COMPLETED	PH	07/17/84	07/20/84	07/24/84	NASA PC R&D Project: Complete NASA Capital Outlays Project Control Report Including All Projected Capital Outlays Through the End of FY 83-84.

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TASK NUMBER	TASK STATUS	RESPONSIBLE PARTY	DATE IDENTIFIED	DATE COMPLETED	MILESTONE DATE	TASK DESCRIPTION
135.	ASSIGNED	MG/CMPS669	04/30/84	-----	-----	Course Development Phase: Develop Instructor's Manual: First Draft.
136.	COMPLETED	PH	07/17/84	08/04/84	08/15/84	NASA PC R&D Project: Prepare General Objectives for the Design of a Common, Microcomputer-Based User Interface to Multiple Online Information Storage and Retrieval Systems.
137.	COMPLETED	WDD/RA TEAM	07/24/84	08/28/84	09/10/84	Complete and Distribute Final Report of FY 83-84 Contract Work to John Wilson, NASA, HQ and to Jack Kolb, DoD.
138.	ASSIGNED	WDD/RA TEAM	07/24/84	-----	09/10/84	Prepare Schematic Diagrams of Interrelationships Among All NASA Contract Educational Activities and Sub-Projects.
139.	ASSIGNED	WDD/RA TEAM	07/24/84	-----	09/10/84	Prepare Schematic Diagrams of Interrelationships Among All NASA Contract PC R&D Activities and Sub-Projects.
140.	COMPLETED	ST/JB	07/24/84	08/02/84	08/02/84	NASA PC R&D Project: Complete USL/DBMS NASA/PC R&D Working Paper Series Entry DBMS.NASA/PC R&D-5. Entitled "General Specifications for the Development of a USL NASA PC R&D Statistical Analysis Support Package".
141.	COMPLETED	FYC	07/24/84	08/15/84	08/02/84	NASA PC R&D Project: Complete USL/DBMS NASA/PC R&D Working Paper Series Entry DBMS.NASA/PC R&D-6. Entitled "General Specifications for the Development of a USL NASA PC R&D Distributed Workstation".
142.	COMPLETED	DM	07/24/84	08/02/84	08/02/84	NASA PC R&D Project: Complete USL/DBMS NASA PC R&D Working Paper Series Entry DBMS.NASA/PC R&D-7. Entitled "The USL NASA PC R&D Interactive Presentation Development System".

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TASK NUMBER	TASK STATUS	RESPONSIBLE PARTY	DATE IDENTIFIED	DATE COMPLETED	MILESTONE DATE	TASK DESCRIPTION
143.	COMPLETED	FYC	07/24/84	08/15/84	08/02/84	NASA PC R&D Project: Complete USL/DBMS NASA/PC R&D Working Paper Series Entry DBMS.NASA/PC R&D-8, Entitled "The USL NASA PC R&D Project: Detailed Specifications of Objectives".
144.	COMPLETED	PH	08/04/84	08/13/84	08/12/84	NASA PC R&D Project: Complete USL/DBMS NASA/PC R&D Working Paper Series Entry DBMS.NASA/PC R&D-9, Entitled "Design Criteria for a PC-Based Common User Interface to Remote Information Systems".

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TASK STATUS LEGEND

COMPLETED	- 100% Completed.
ASSIGNED	- Work has been assigned to responsible party; minimal progress to date.
REQUESTED	- Work, information, documentation, or whatever the task implies has been requested from the appropriate NASA official.
XX%	- XX% of the work has been completed as of the date of revision of this document. (document will be updated weekly).
REVIEW	- Draft of work has been completed; now in review process.
REVISION	- Draft work is in process of being revised based on reviews comments.
DEFERRED	- Task had been initiated, but has subsequently been deferred to a later time.
FUTURE	- Task is to be addressed at a time well into the future, e.g. 3+ months from current date.
-----	- Task as yet to be assigned/scheduled.

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RESPONSIBLE PARTY & CONTACT PERSON LEGEND

JW	-	JOHN WILSON	NASA HQ Official & Primary NASA Contact Person: (202) 453-2933.
JK	-	JACK KOLB	Principal Army Technical Information Officer, Directorate for Technology Planning and Management & Primary DoD Contact Person: (202) 274-8671
PE	-	PHILIP ECKERT	NASA Scientific and Technical Information Facility Training Officer: (301) 859-5300
WDD	-	WAYNE D. DOMINICK	USL Contract Principal Investigator: (318) 231-6308
FYC	-	FRANK Y. CHUM	USL Contract Research Assistant: (318) 231-6338
ST	-	SPIROS TRIANTAFYLLOPOULOS	USL Contract Research Assistant: (318) 235-1358
MG	-	MARTIN GRANIER	USL Contract Research Assistant: (318) 231-6284
PH	-	PHILIP HALL	USL Contract Research Assistant: (318) 231-6284
SG	-	SUZY GALLAGHER	USL Contract Research Assistant: (318) 231-6284
DM	-	DENNIS MOREAU	USL Contract Research Assistant: (318) 231-6284 (318) 235-1358
LR	-	LEROY ROQUEMORE	SU Contract Principal Investigator: (504) 771-2060
MJ	-	MICHAEL JAMES	SU Contract Research Assistant: (504) 771-2060
BR	-	BENNIE ROLLINS	SU Contract Research Assistant: (504) 771-2060
SK	-	SRINU KAVI	USL CMPS Graduate Student: (318) 231-6284

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KHN -	KIL-HYUN NAM	USL CMPS Graduate Student: (318) 231-6284
WCY -	WEI-CHUNG YU	USL CMPS Graduate Student: (318) 231-6284
MS -	MUFID SOKOLOVICH	USL CMPS Graduate Student: (318) 231-6284
SM -	STAMATIS MARMARITSAKIS	USL CMPS Graduate Student: (318) 231-6284
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SEM -	SHERIEF EL-MOUGHY	USL CMPS Graduate Student: (318) 231-6284
CAP -	CARLOS A. PENA	USL CMPS Graduate Student: (318) 231-6284
LY -	LIN YAN	USL CMPS Graduate Student: (318) 231-6284
JB -	J. BASSARI	USL CMPS Undergraduate Student: (318) 231-6284
SKN -	S. K. NG	USL CMPS Undergraduate Student: (318) 231-6284
KST -	K. S. TANG	USL CMPS Undergraduate Student: (318) 231-6284
NVN -	NANCY VAN NORTWICK	IBM PC Equipment Contact Person: (504) 293-3750

ATTACHMENT 1.2

**SU NASA TASKS/STATUS PROJECT
MANAGEMENT AND CONTROL REPORT**

NASA/RECON TASK STATUS REPORT

<u>Task No.</u>	<u>Task Status</u>	<u>Responsible Party</u>	<u>Date Identified</u>	<u>Date Completed</u>	<u>Milestone Date</u>	<u>Task Description</u>
005	Completed	LR/WDD	01/11/83	04/06/83	03/24/83	Develop NASA/RECON Proposal.
010	Completed	LR/WDD	01/11/83	05/27/83	05/23/83	Submit preliminary proposal to John Wilson at NASA Headquarters.
015	Completed	LR	08/15/83	01/09/84	08/22/83	Establish NASA/RECON Contract R&D Team (RA's, Part-time Secretary).
020	Completed	LR/MAJ/BR	08/15/83	05/08/84	06/21/84	Establish/organize and maintain automated RECON file.
025	Completed	LR/WDD	09/12/83	12/08/83	09/30/83	Gain NASA Contracts Office approval for pre-contract funding.
030	Completed	LR	10/10/83	11/01/83	11/02/83	Develop sub-contract for Sub-contractor University-USL.
035	Completed	LR	10/10/83	11/17/83	11/04/83	Attain SU approval of proposed subcontract.
040	Completed	LR	10/10/83	12/07/83	12/10/83	SU requests USL's approval of subcontract.
045	Completed	LR/WDD	10/10/83	12/07/83	12/10/83	SU and USL jointly sign subcontract.
050	Completed	LR/WDD	10/25/83	11/02/83	10/31/83	Prepare NASA/RECON Proposal Status Report for Dr. Hans Mark, Deputy Administrator for NASA.

NASA/RECON TASK STATUS REPORT

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055	Completed	DAD	11/17/83	11/17/83	11/17/83	SU sent statement of work and invitation to submit RECON Proposal covering statement of work.
060	Completed	LR/WDD	11/17/83	11/17/83	11/17/83	SU provides required number of proposals to NASA Contracts Office.
065	Completed	DAD	12/05/83	12/07/83	12/07/83	NASA Contracts Office submits NASA/RECON Contract to SU.
070	Completed	LR/WDD	09/30/83	12/08/83	10/01/83	Official Contract signatures from NASA and SU authorities acquired.
075	Completed	LR	12/08/83	01/19/84	01/09/84	Establish procedure for reimbursement to Subcontractor Institution-USL.
080	Completed	LR/WDD	01/02/84	01/11/84	01/16/84	Prepare contract material/handout for NASA/RECON Team Members.
085	Completed	MAJ/BR	01/05/84	01/06/84	01/06/84	Locate/identify NASA/RECON Telecommunications work station at SU.
086	Completed	MAJ/BR	01/05/84	02/11/84	02/12/84	Prepare prospective floor plan for configuration of NASA/RECON telecommunications work station at SU.
090	Completed	LR/MAJ/BR	01/14/84	02/02/84	02/02/84	Attendance at NASA/RECON Workshop at USL.
095	Completed	MAJ/BR	01/14/84	02/28/84	02/28/84	Equipment analysis/recommendations: PC's vs. terminals.
100	-----	WDD/LR	01/17/84	-----	-----	Equipment acquisition approvals from NASA, HQ.

105	Completed	WDD/LR/JW	01/17/84	-----	-----	Needs analysis phase: identify target institutions.
110	Completed	WDD/LR	01/17/84	-----	-----	Needs analysis phase: survey target institutions.
115	Completed	WDD/LR	01/17/84	06/20/84	-----	Needs analysis phase: NASA Interim Report No. 1.
120	Assigned	LR/MAJ/BR	01/17/84	-----	09/10/84	Equipment procurement/installation/operational tested.
125	Assigned	LR/WDD/JW	01/17/84	-----	-----	Needs analysis phase: identify target institutions.
130	Completed	MAJ/BR	01/12/84	06/10/84	06/08/84	Develop IS & RS/DBMS Reference Materials List for NASA/RECON.
235	Completed	LR/MAJ/BR	01/21/84	06/10/84	06/10/84	Identify prospective M.S. level thesis/project topics relating to RECON.
140	Completed	LR	01/22/84	01/20/84	01/30/84	Received and reviewed first USL progress/status report submitted by Wayne Dominick.
145	Completed	MAJ/BR	01/23/84	04/29/84	04/29/84	Needs analysis phase: develop institution survey mailing list.
150	Completed	LR/MAJ/BR	01/23/84	04/29/84	04/29/84	Needs analysis phase: develop items for needs analysis questionnaire.
155	Assigned	LR/AJ/WDD MAJ/BR	01/23/84	-----	05/08/84	Course development phase: develop course visuals.
160	Assigned	LR/AJ/WDD MAJ/BR	01/23/84	-----	05/08/84	Course development phase: lesson plans development.

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165	Assigned	LR/AJ/WDD MAJ/BR	01/23/84	-----	05/08/84	Course development phase: develop RECON user assignments and answer keys.
170	Assigned	WDD/LR	01/25/84	-----	02/07/84	Develop NASA working paper series documentation standards.
175	Assigned	LR/WDD	02/01/84	-----	03/15/84	Establish NASA/RECON Program review and evaluation structure for Dr. Frank B. McDonald, Chief Scientist for NASA as directed by the Deputy Admini- strator for NASA, Dr. Hans Mark.
180	Completed	MAJ/BR	02/06/84	02/06/84	02/08/84	Develop design for NASA/RECON SU/USL telecommunications work- station.
185	Completed	MAJ/BR	02/07/84	02/07/84	02/08/84	Secure SU Administration approval for environmental configuration for proposal design of tele- communications work station.
190	Completed	MAJ/BR	02/08/84	03/02/84	03/02/84	Develop outline for SU Technology Show Seminar on NASA/RECON System.
195	Completed	LR	02/10/84	02/10/84	02/10/84	Prepare/send thank you letters to NASA/RECON Workshop instruct- ors (Hal Wynne, Philip Eckert) and to Wayne Dominick.
200	Assigned	LR/WDD	02/10/84	-----	03/01/84	Prepare/submit first interim report to John Wilson, NASA HQ.
205	Completed	LR/MAJ/BR	02/13/84	02/14/84	02/14/84	Assist Wayne Dominick with NASA/ RECON Workshop.

210	Completed	MAJ/BR	02/16/84	02/17/84	02/19/84	Develop automated system for NASA/RECON Task Status Report Generation.
215	Completed	MAJ/BR	02/16/84	02/18/84	02/25/84	Develop NASA/RECON publicity article for the SU Campus Newspaper.
220	Completed	MAJ/BR	02/21/84	02/21/84	02/21/84	Submit NASA/RECON article to SU Digest (Student Newspaper - SU).
225	Completed	LR/WDD	02/21/84	02/29/84	02/29/84	Prepare Interim Report No. 1 for submission to NASA.
230	Completed	MAJ/BR	03/01/84	03/01/84	03/01/84	Conduct seminar on NASA/RECON during Annual Computer Science Spring Technology Conference.
235	Completed	MAJ/BR	03/03/84	05/24/84	05/25/84	Prepare questionnaires for review of effectiveness of NASA/RECON Seminar.
240	Completed	MAJ/BR	03/03/84	05/25/84	05/25/84	Evaluate and compile results of NASA/RECON Seminar Questionnaire.
245	Completed	MAJ/BR	03/22/84	06/13/84	06/15/84	Develop reference list of documents pertaining to the subject of Automated Information Storage & Retrieval Systems.
250	Completed	LR/MAJ/BR	04/03/84	05/15/84	05/15/84	Secure approval for implementation of NASA/RECON course for SU Officials.
255	Completed	LR/MAJ/BR	04/03/84	05/15/84	05/15/84	Submit schedule for NASA/RECON class in Spring 1984 Semester.

256	Completed	MAJ/BR	04/11/84	05/24/84	05/24/84	Update Task Status Report 1.
257	Completed	MAJ/BR	04/11/84	05/25/84	05/25/84	Review and update automated document description filing routines.
258	Completed	LR/MAJ/BR	04/12/84	04/22/84	04/22/84	Prepare guidelines for development of course lesson plans.
259	Completed	LR/MAJ/BR	05/10/84	07/15/84	07/15/84	Develop course homework assignment/answer keys for NASA/RECON course.
260	Completed	LR/MAJ/BR	05/15/84	07/25/84	07/25/84	Develop course usage assignment/answer keys for NASA/RECON course.
265	Completed	MAJ/BR	06/10/84	06/18/84	06/20/84	Restructuring of file system under 'MUSIC' Operating System on SU's IBM 4341.
270	Completed	MAJ/BR	06/02/84	06/15/84	06/18/84	Develop procedure listing for file access and retrieval on MUSIC/NASA RECON File System.
275	Completed	LR/MAJ/BR	06/02/84	06/17/84	06/17/84	Prepare and submit IBM micro-computer/software purchase requisitions.
280	Completed	MAJ/BR	06/11/84	06/18/84	06/20/84	Move NASA 'Hard' files to temporary offices in SU Computer Science Department main office.
283	Completed	LR/WDD	06/12/84	08/24/84	08/24/84	Prepare final report for submission to Mr. John Wilson at NASA HQ.

285	Completed	LR/MAJ/BR	06/13/84	07/11/84	07/16/84	Secure log-on ID on IBM 4341 under MUSIC Operating System for storage of interactive data-base and report generators (MUSIC/NASA/RECON).
290	Completed	MAJ/BR	06/15/84	06/27/84	06/30/84	Develop log sheet for use when interacting with NASA/RECON System.
300	Completed	MAJ/BR	06/15/84	06/20/84	06/18/84	Develop log sheet for research staff meetings.
310	Completed	MAJ/BR	06/22/84	06/22/84	06/22/84	Update Task Status Report-2.
315	Assigned	LR/WDD	06/22/84	-----	09/03/84	Develop NASA/RECON Phase II Proposal.
320	Completed	MAJ/BR	06/24/84	06/27/84	06/29/84	Develop preliminary general course outline for use in designing NASA/RECON course.
330	Completed	MAJ/BR	06/24/84	06/27/84	06/29/84	Develop preliminary course description of NASA/RECON course.
340	Completed	MAJ/BR	06/24/84	06/27/84	06/29/84	Update MUSIC/NASA/RECON file description section of MUSIC/NASA/RECON Project Management System.
350	Completed	MAJ/BR	06/24/84	06/27/84	06/29/84	Update and continue to expand NASA/RECON course preliminary bibliography file.
360	Completed	MAJ/BR	06/27/84	07/06/84	07/06/84	Create log file for all institutions which were targeted for distribution of the Needs Analysis Questionnaire.

370	Completed	MAJ/BR	06/27/84	06/30/84	07/03/84	Prepare log-on sheets for NASA/RECON connect sessions.
380	Completed	MAJ/BR	06/27/84	06/29/84	07/01/84	Prepare information form for NASA/RECON researchers meeting.
390	Assigned	LR/MAJ/BR	06/29/84	-----	09/25/84	Prepare guidelines for development of course visuals.
400	Completed	MAJ/BR	07/07/84	07/10/84	07/16/84	Create MUSIC/NASA/RECON interactive database of target institutions.
405	Completed	MAJ/BR	08/01/84	08/03/84	08/03/84	Receive and file updated corporate source authority list.
410	Assigned	MAJ/BR	08/02/84	-----	09/02/84	Prepare and file supplemental documentation for prepared course visuals.
420	Assigned	MAJ/BR	08/02/84	-----	09/02/84	Prepare and file supplemental documentation for prepared course lesson plans.
425	Completed	MAJ/BR	08/07/84	08/08/84	08/08/84	Receive and authorize use of current NASA/RECON password.
427	Completed	LR/MAJ/BR	08/07/84	08/22/84	08/27/84	Review and file IBM microcomputer/software purchase requisition.
428	Completed	MAJ/BR	08/09/84	08/15/84	08/17/84	Complete implementation of MUSIC/NASA/RECON file description.
429	Completed	MAJ/BR	08/13/84	08/25/84	08/25/84	Prepare notes, visuals, etc., for seminar to be presented on NASA/RECON for Computer Science Faculty for Fall, 1984 Semester.

NASA/RECON TASK STATUS REPORT

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430	Assigned	MAJ/BR	08/16/84	-----	08/31/84	Relocate NASA/RECON files to NASA/RECON Research Lab, Room 119, T. T. Allain Hall.
435	Completed	MAJ/BR	08/16/84	08/25/84	08/26/84	Prepare notes, visuals, etc., for seminar to be presented to SU ACM and DPMA Chapters.
440	Completed	MAJ/BR	08/16/84	08/16/84	08/16/84	Submit log-on sheet for NASA/RECON connect session for final approval.
450	Completed	MAJ/BR	08/16/84	08/16/84	08/16/84	Submit information form for NASA/RECON researcher's meetings for final approval.
460	Completed	MAJ/BR	08/21/84	08/22/84	08/22/84	Update NASA/RECON Users Manual with current fliers received from NASA STI facility.
470	Completed	MAJ/BR	08/21/84	08/22/84	08/22/84	Create interactive file of current postings and fliers received from NASA.

ATTACHMENT 2.1

**NEEDS ANALYSIS PHASE:
LIST OF TARGETED INSTITUTIONS**

Vice-President, Academic Affairs
Univ of Alaska
Fairbanks AK 99701

Vice-President, Academic Affairs
Univ of Arizona
Tucson AZ 85721

Vice-President, Academic Affairs
California Inst. of Technology
Pasadena CA 91125

Vice-President, Academic Affairs
Univ of California
Lawrence Livermore Lab
Livermore CA 94550

Vice-President, Academic Affairs
Colorado State Univ
Ft Collins CO 80523

Vice-President, Academic Affairs
Cornell Univ
Ithaca NY 14853

Vice-President, Academic Affairs
Univ of Dayton
Research Institute
Dayton OH 45469

Vice-President, Academic Affairs
Arizona State Univ
Tempe AZ 85257

Vice-President, Academic Affairs
Univ of Arkansas
Fayetteville AR 72701

Vice-President, Academic Affairs
Univ of California
Lawrence Berkeley Lab
Berkeley CA 94720

Vice-President, Academic Affairs
Univ of California
Los Alamos National Lab
Los Alamos NM 87545

Vice-President, Academic Affairs
Univ of Colorado
Boulder CO 80309

Vice-President, Academic Affairs
Dartmouth College
Hanover NH 03755

Vice-President, Academic Affairs
Embry Riddle Aeronautical Univ
Daytona Bch FL 32014

Vice-President, Academic Affairs
Florida Institute of Technology
Melbourne FL 32901

Vice-President, Academic Affairs
Georgia Institute of Technology
Atlanta GA 30332

Vice-President, Academic Affairs
Johns Hopkins Univ
Laurel MD 20707

Vice-President, Academic Affairs
Massachusetts Inst. of Technolog
Cambridge MA 02139

Vice-President, Academic Affairs
Univ of Michigan
Ann Arbor MI 48109

Vice-President, Academic Affairs
Univ of Missouri-Rolla
Rolla MO 65401

Vice-President, Academic Affairs
Pennsylvania State Univ
State College PA 16801

Vice-President, Academic Affairs
Princeton Univ
Princeton NJ 08544

Vice-President, Academic Affairs
Univ of Florida
Gainesville FL 32611

Vice-President, Academic Affairs
Univ of Iowa
Iowa City IA 52242

Vice-President, Academic Affairs
Univ of Kansas
Lawrence KS 66045

Vice-President, Academic Affairs
Massachusetts Inst. of Technolog
Lexington MA 02173

Vice-President, Academic Affairs
Univ of Minnesota
Minneapolis MN 55455

Vice-President, Academic Affairs
Univ of New Mexico
Albuquerque NM 87131

Vice-President, Academic Affairs
Univ of Pittsburgh
Pittsburgh PA 15260

Vice-President, Academic Affairs
Purdue Univ
W Lafayette IN 47907

Vice-President, Academic Affairs
Rockefeller Univ
New York NY 10021

Vice-President, Academic Affairs
Univ of Southern California
Los Angeles CA 90007

Vice-President, Academic Affairs
Texas A&M Univ
College Sta TX 77843

Vice-President, Academic Affairs
Univ of Utah
Salt Lake Cy UT 84112

Vice-President, Academic Affairs
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Dean, College of Physical Science
Ohio Northern Univ
Ada OH 45810

Dean, College of Physical Science
Univ of Oklahoma
Norman OK 73019

Dean, College of Physical Science
Univ of Oklahoma
Oklahoma City OK 73190

Dean, College of Physical Science
Northeast Missouri State Univ
Kirksville MO 63501

Dean, College of Physical Science
Northern Arizona Univ
Flagstaff AZ 86011

Dean, College of Physical Science
Northern Illinois Univ
DeKalb IL 60115

Dean, College of Physical Science
Northwestern Univ
Evanston IL 60201

Dean, College of Physical Science
Univ of Notre Dame
Notre Dame IN 46556

Dean, College of Physical Science
Ohio State Univ
Columbus OH 43210

Dean, College of Physical Science
Oklahoma State Univ
Stillwater OK 74078

Dean, College of Physical Science
Oregon Health Sciences Univ
Portland OR 97207

Dean, College of Physical Science
Oregon State Univ
Corvallis OR 97331

Dean, College of Physical Science
Pennsylvania State Univ
Hershey PA 17033

Dean, College of Physical Science
Pennsylvania State Univ
Univ Park PA 16802

Dean, College of Physical Science
Phillips Univ
Enid OK 73702

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Portland State Univ
Portland OR 97207

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Rensselaer Polytechnic Institute
Troy NY 12181

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Piscataway NJ 08854

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Saint Louis Univ
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San Diego State Univ
San Diego CA 92182

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Univ of Santa Clara
Santa Clara CA 95053

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Univ of South Dakota
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Research Institute
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Pennsylvania State Univ
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University AL 35486

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Dean, College of Engineering
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Auburn AL 36849

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Drexel Univ
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Dean, College of Engineering
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Hempstead NY 11550

Dean, College of Engineering
Houghton College
Houghton NY 14744

Dean, College of Engineering
Howard Univ
Washington DC 20059

Dean, College of Engineering
George Washington Univ
Washington DC 20036

Dean, College of Engineering
Univ of Georgia
Athens GA 30602

Dean, College of Engineering
Hahnemann Medical Coll & Hospita
Philadelphia PA 19102

Dean, College of Engineering
Harvard Univ
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Dean, College of Engineering
Herbert Lehman College
Bronx NY 10468

Dean, College of Engineering
Holy Cross College
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Dean, College of Engineering
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Houston TX 77004

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Pocatello ID 83209

Dean, College of Engineering
Univ of Idaho
Moscow ID 83843

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at Chicago Circle
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Dean, College of Engineering
Indiana Institute of Technology
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Dean, College of Engineering
Iowa State Univ
Ames IA 50011

Dean, College of Engineering
Kansas State Univ
Manhattan KS 66506

Dean, College of Engineering
Lehigh Univ
Bethlehem PA 18015

Dean, College of Engineering
Lock Haven State Univ
Lock Haven PA 17745

Dean, College of Engineering
Louisiana State Univ
Baton Rouge LA 70803

Dean, College of Engineering
Illinois Institute of Technology
Chicago IL 60616

Dean, College of Engineering
Univ of Illinois
Urbana IL 61801

Dean, College of Engineering
Institute of Storm Research
Houston TX 77006

Dean, College of Engineering
Johns Hopkins Univ
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Dean, College of Engineering
Univ of Kentucky
Lexington KY 40506

Dean, College of Engineering
Letorneau College
Longview TX 75607

Dean, College of Engineering
Long Island Univ of Brookville
Greenville NY 11548

Dean, College of Engineering
Louisiana Tech Univ
Ruston LA 71272

Dean, College of Engineering
Univ of Louisville
Louisville KY 40292

Dean, College of Engineering
Manhattan College
Bronx NY 10471

Dean, College of Engineering
Univ of Maryland
College Park MD 20742

Dean, College of Engineering
Medical College of Wisconsin
Milwaukee WI 53226

Dean, College of Engineering
Memphis State Univ
Memphis TN 38152

Dean, College of Engineering
Univ of Miami
Coral Gables FL 33124

Dean, College of Engineering
Michigan Technological Univ
Houghton MI 49931

Dean, College of Engineering
Mississippi State Univ
State College MS 39762

Dean, College of Engineering
Univ of Maine at Orono
Orono ME 04469

Dean, College of Engineering
Univ of Maryland
Baltimore MD 21201

Dean, College of Engineering
Univ of Massachusetts
Amherst MA 01003

Dean, College of Engineering
Meharry Medical College
Nashville TN 37208

Dean, College of Engineering
Miami Univ
Oxford OH 45056

Dean, College of Engineering
Michigan State Univ
East Lansing MI 48824

Dean, College of Engineering
Univ of Michigan
Ann Arbor MI 48109

Dean, College of Engineering
Univ of Mississippi
University MS 38677

Dean, College of Engineering
Univ of Missouri
Columbia MO 65211

Dean, College of Engineering
Univ of Nebraska
Lincoln NE 68588

Dean, College of Engineering
New Jersey Inst. of Technology
Newark NJ 07102

Dean, College of Engineering
New Mexico State Univ
Las Cruces NM 88003

Dean, College of Engineering
New York State Coll of Ceramics
Alfred NY 14802

Dean, College of Engineering
New York Univ
New York NY 10012

Dean, College of Engineering
U of North Carolina at Charlotte
Charlotte NC 28223

Dean, College of Engineering
North Carolina State Univ
Raleigh NC 27650

Dean, College of Engineering
Montana State Univ
Bozeman MT 59717

Dean, College of Engineering
Univ of Nevada
Reno NV 89557

Dean, College of Engineering
New Mexico Institute of Mining
and Technology
Socorro NM 87801

Dean, College of Engineering
Univ of New Orleans
New Orleans LA 70148

Dean, College of Engineering
New York Univ
Courant Institute
New York NY 10012

Dean, College of Engineering
Norfolk State Univ
Norfolk VA 23501

Dean, College of Engineering
U of North Carolina at Wilmington
Wilmington NC 28401

Dean, College of Engineering
Univ of North Carolina
Chapel Hill NC 27515

Dean, College of Engineering
Northeast Louisiana Univ
Moroe LA 71203

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Northeastern Univ
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Univ of Northern Colorado
Greeley CO 80639

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Northrop Univ
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Dean, College of Engineering
Southern University
Baton Rouge LA 70813

ATTACHMENT 2.2

**NEEDS ANALYSIS PHASE:
QUESTIONNAIRE COVER LETTER
TO
TARGETED INSTITUTIONS**



National Aeronautics and
Space Administration

Washington, D.C.
20546

Reply to Attn of:

March 30, 1984

Dear Colleague:

Pursuant to a research and development contract with the National Aeronautics and Space Administration (NASA), the University of Southwestern Louisiana (USL) and Southern University (SU) are jointly addressing the needs analysis, development, pilot administration, and evaluation of a set of transportable, university-level courses to educate science and engineering students in the principles, concepts, and effective use of computer-based, scientific and technical bibliographic information storage and retrieval systems.

This project was initiated to provide a framework whereby science and engineering graduates from colleges and universities offering such courses can gain the experience, skills, and motivation necessary for the effective use of the types of automated research support systems that would be an integral part of their subsequent R&D working environment.

In order to accomplish this objective, these courses will be designed to address a non-computer-professional audience, specifically, senior-level science and engineering undergraduate students, with the intent that the courses ultimately be offered by individual Physical Sciences and Engineering Departments within the university; to address both state-of-the-art concepts, principles, and capabilities that are generalizable across systems as well as specific, pragmatic techniques for effectively utilizing existing systems and data bases; and to incorporate extensive hands-on interactive usage by students with a number of large-scale scientific and technical information systems and data bases, such as the NASA RECON system and its supported data bases.

This is a multi-year project that, in addition to the initial needs analysis, course development, pilot administration and evaluation activities, will involve the conduct of regional and on-site seminars for interested colleges and universities, course material dissemination, assistance in relating course material to existing university curricula, institutional and graduated student surveys and evaluations, continual state-of-the-art course enhancements, and the like.

In order to initiate this major project, we are requesting your assistance in completing the attached needs analysis questionnaire. This questionnaire is being distributed to



Academic Vice-Presidents and Deans of Colleges of Physical Sciences and Engineering of major colleges and universities throughout the country. The questionnaire is intended to collect baseline data concerning computer usage and information storage and retrieval system usage within your university's Physical Sciences and Engineering colleges/departments, your assessment of educational needs in these areas, your potential interest in the results of our efforts, and, of course, any comments which you may have concerning these issues.

We feel that the colleges and universities that do participate in these activities will benefit from the results of our efforts in a number of ways, including enhanced educational opportunities for their undergraduate science and engineering students, enhanced marketability of graduating students, enhanced opportunities for contract research and development work with the agencies whose systems will be addressed within the courses, and numerous additional benefits.

Please return completed questionnaires not later than April 30, 1984 to:

Dr. Wayne D. Dominick
NASA/RECON PROJECT
University of Southwestern Louisiana
Computer Science Department
P. O. Box 44330
Lafayette, LA 70504

If you have any questions concerning the needs analysis questionnaire, please feel free to contact any of the undersigned individuals.

Thank you in advance for your very important participation in the needs analysis phase of this project.

Sincerely,



Wayne D. Dominick
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Attachment

ATTACHMENT 2.3

**NEEDS ANALYSIS PHASE:
NEEDS ANALYSIS QUESTIONNAIRE**

TRANSPORTABLE INFORMATION STORAGE AND RETRIEVAL SYSTEM COURSES

NEEDS ANALYSIS QUESTIONNAIRE

Position of Respondent: _____

Institution Name: _____

Address: _____

 Note: Throughout the questionnaire, if more than one answer to a
 question is applicable, please check all that apply.

PART 1

INFORMATION ABOUT THE UNIVERSITY

1.1 Different universities place emphasis on different educational objectives. The following is a brief list of possible objectives that may or may not be stressed by your university.

For each group, please check the response corresponding to how important an item is for a senior undergraduate student within your university in Physical Sciences and Engineering.

Computer Usage

Physical
Sciences

Engineering

- | | |
|---|--------------------------|
| <input type="checkbox"/> Very important (e.g., more than 2 classes required) | <input type="checkbox"/> |
| <input type="checkbox"/> Important (e.g., 1 to 2 classes required) | <input type="checkbox"/> |
| <input type="checkbox"/> Desirable (e.g., not required, but highly recommended) | <input type="checkbox"/> |
| <input type="checkbox"/> Optional (at the student's discretion) | <input type="checkbox"/> |
| <input type="checkbox"/> Not applicable | <input type="checkbox"/> |

Research Skills

- | | |
|--|--------------------------|
| <input type="checkbox"/> Very Important (e.g., Baccalaureate Thesis required) | <input type="checkbox"/> |
| <input type="checkbox"/> Important (e.g., formal training in research techniques required) | <input type="checkbox"/> |
| <input type="checkbox"/> Desirable (e.g., no formal training, but some skills expected) | <input type="checkbox"/> |
| <input type="checkbox"/> Optional | <input type="checkbox"/> |

1.2 Which of the following describe the access of students in Physical Sciences and Engineering departments to computing facilities?

Physical
Sciences

Engineering

- ☐ Terminals in the department used to access a computer located on the campus
- ☐ Terminals in the department used to access a remote computer not on the campus
- ☐ Terminals located in some other location outside of the department
- ☐ Personal computer workstations located in the department
- ☐ Personal computer workstations available for use but not located in the department

PART 2

INFORMATION STORAGE AND RETRIEVAL SYSTEM USAGE

2.1 Are online information storage and retrieval systems available for use by students at your university?

YES

NO

UNDECIDED

(If "NO", please skip this section and go to PART 3)

2.2 To which departments are these systems available?

- ☐ All Physical Sciences departments
- ☐ All Engineering departments
- ☐ Only specific Physical Sciences and/or Engineering departments: Please specify which departments

- ☐ Other departments: Please specify which departments

2.3 Which systems are available?

- | | | |
|---------------------------------------|---------------------------------------|--|
| <input type="checkbox"/> BASIS | <input type="checkbox"/> DTIC/DROLS | <input type="checkbox"/> PERGAMON/INFOLINE |
| <input type="checkbox"/> BROWSER | <input type="checkbox"/> ENERGY/RECON | <input type="checkbox"/> QUESTEL |
| <input type="checkbox"/> BRS | <input type="checkbox"/> IGS | <input type="checkbox"/> SPIRES |
| <input type="checkbox"/> CAN/OLE | <input type="checkbox"/> ISI | <input type="checkbox"/> STAIRS |
| <input type="checkbox"/> CAS | <input type="checkbox"/> LEADER | <input type="checkbox"/> TIS |
| <input type="checkbox"/> CGIS | <input type="checkbox"/> MEDLINE | <input type="checkbox"/> Inhouse system(s) |
| <input type="checkbox"/> CSIN | <input type="checkbox"/> NASA/RECON | <input type="checkbox"/> Other(s): |
| <input type="checkbox"/> DATA CENTRAL | <input type="checkbox"/> OCLC | <input type="checkbox"/> Please specify: |
| <input type="checkbox"/> DIALOG | <input type="checkbox"/> ORBIT | _____ |
| | | _____ |
| | | _____ |

2.4 Are these systems available to:

- ☐ Faculty
- ☐ Staff
- ☐ Students for coursework
- ☐ Students for research
- ☐ The general student body
- ☐ The general public

2.5 How is the availability of database searching advertised?

- ☐ Newsletters
- ☐ Seminars
- ☐ Non-credit courses
- ☐ For-credit courses
- ☐ Other: Please specify: _____

2.6 Select the person(s) responsible for conducting online searches at your university:

- ☐ Librarian
- ☐ Other staff
- ☐ Faculty
- ☐ Students
- ☐ Any trained individual

2.7 What funding source(s) are used to pay for the services?

- ☐ User
- ☐ Department
- ☐ University
- ☐ External Grant(s)/Contract(s)
- ☐ Other: Please specify: _____

PART 3

INFORMATION STORAGE AND RETRIEVAL SYSTEM EDUCATIONAL NEEDS

3.1 Would your university be interested in offering your Physical Sciences and Engineering students an opportunity to learn the principles and concepts of online information storage and retrieval systems, to understand the types of scientific and engineering database services that are available, and to interact with such systems and services?

YES

NO

UNDECIDED

ALREADY OFFERING PRECISELY SUCH COURSES

3.2 What format(s)/duration(s) do you feel such an educational program should take?

- ☐ 2-3 days workshops
- ☐ 4-6 week mini-courses
- ☐ Full quarter courses
- ☐ Full semester courses

3.3 Do you feel that formal education in these areas, coupled with hands-on experience with one or more major online retrieval systems such as NASA/RECON, would appreciably increase the professional marketability of your graduating scientists and engineers?

YES

NO

UNDECIDED

3.4 If your answer to the preceding question was "YES", did you base your opinion on:

- ☐ Needs expressed by faculty, students and/or alumni?
- ☐ Requirements expressed by potential employers of your graduates?
- ☐ Experience gained through participation in research grants and/or contracts?
- ☐ Knowledge gained through professional literature?
- ☐ Other: Please specify: _____

3.5 What do you foresee as the major obstacles toward teaching and utilizing information storage and retrieval systems more extensively at your university?

- ☐ Diverse departmental needs
- ☐ Logistical problems
- ☐ Availability of comprehensive course materials
- ☐ Availability of funding
- ☐ Other: Please specify: _____
- ☐ None

PART 4

INFORMATION STORAGE AND RETRIEVAL SYSTEM EDUCATIONAL COURSES

4.1 When transportable information storage and retrieval system courses are available, would your university be interested in incorporating the pre-packaged educational program into your Physical Sciences and/or Engineering curricula?

YES

NO

QUALIFIED: Consideration would be contingent upon:

- ☐ The university's opportunity for input into the development phases of the courses
- ☐ The possibility of pre-evaluation of all course materials
- ☐ The availability of onsite seminars, demonstrations and/or teaching assistance
- ☐ The possibility of funding support for system access costs
- ☐ Other: Please specify: _____

4.2 Which of the following educational materials would you like to see incorporated within the transportable course packages:

- | | |
|---|---|
| <input type="checkbox"/> Course syllabi | <input type="checkbox"/> Discussion topics |
| <input type="checkbox"/> Lesson plans | <input type="checkbox"/> Workbooks |
| <input type="checkbox"/> Overhead transparencies | <input type="checkbox"/> Textbooks |
| <input type="checkbox"/> Homework assignment
(with answer keys) | <input type="checkbox"/> Bibliographies |
| <input type="checkbox"/> Hands-on usage assignments
(with answer keys) | <input type="checkbox"/> Support handouts |
| <input type="checkbox"/> Examinations
(with answer keys) | <input type="checkbox"/> Videotapes and/or films |
| | <input type="checkbox"/> Other: Please specify: _____ |

PART 5
COMMENTS

Thank you very much for completing this questionnaire.

If you wish to add any comments about any of the specific questions asked, please feel free to do so.

Question
Number

Comments

—	
—	
—	
—	
—	
—	
—	
—	

General Comments:

If you would like to receive a summary of this survey and/or more information about the contract activities, please check the following items:

- Would like to receive a summary of the results of this survey.
- Would like to be placed on our mailing list for dissemination of information related to the contract activities.

ATTACHMENT 2.4

**NEEDS ANALYSIS PHASE:
NEEDS ANALYSIS QUESTIONNAIRE
RESULTS**

TRANSPORTABLE INFORMATION STORAGE AND RETRIEVAL SYSTEM COURSES

NEEDS ANALYSIS QUESTIONNAIRE

INTERPRETATION SUMMARY

The needs analysis questionnaire was distributed to 237 colleges and universities in April, 1984 and was completed and returned by 161 respondents. This document represents an overview of the analysis of those responses. All percentages indicated in the summary represent a proportion of the number of respondents who actually responded to the specific question.

EDUCATIONAL OBJECTIVES

The results demonstrated that computer usage was considered to be more important in the Engineering Departments of the universities surveyed (86.8% Very Important or Important) than in the Physical Science Departments (68.2% Very Important or Important). On the other hand, development of research skills was considered a more important objective in the Physical Science Departments (59.7% Very Important or Important) than in the Engineering Departments (48.8% Very Important or Important).

COMPUTER ACCESS

Engineering departments have a slightly higher incidence of

computing facilities located in the department as would be expected from the results of the previous section. The difference is not, however, significant. The survey demonstrated that the responding universities do have substantial computing facilities available to both Physical Science and Engineering Departments and that the availability of local computing access facilities to support the implementation of online training sessions should not present a major obstacle to implementation of the proposed course.

IS&R SYSTEM USAGE

Of the 161 universities responding to the survey, 116 (72%) reported the availability of one or more IS&R systems on campus. The systems were reported as being available to Physical Science students in 76.6% of the universities responding and to Engineering students in 68.2% of the universities responding. The maximum number of systems available at any one university was 15 and the average number available at those locations which had any availability was 4.5. Twenty-five of the locations reported the availability of only one system on their campus. The most popular system was DIALOG (88 locations) followed by BRS (56), OCLC (54), ORBIT (42) and MEDLINE (40). The NASA/RECON system was available at 20 locations. Twenty-six universities possessed in-house systems.

The systems were almost universally available to faculty and staff and 87% of the universities had these systems available to

students for research activities. The systems were available to students for coursework in 68.7% of the locations and to the general student body in 60%. The systems were made available to the general public at 41 universities (35.7%).

Librarians conducted online searches at 94.8% of the universities. Faculty and staff conducted online searches at 22.4% of the locations reporting. Students were reported as conducting searches at only 8.6% of the universities but 18.1% reported that any trained individuals had access to online search capabilities.

The funding sources for fees associated with online searches represented a mixture of sources. Payment of fees by users was reported by 73.1% of the respondents and payment by departments at 64.3%. A significant percentage of the universities (61.7%) reported the availability of grant or contract funds to cover these expenses. The university provided some funding support for these activities in 53% of the locations reporting.

IS&R SYSTEM EDUCATIONAL NEEDS

The survey indicated that 7.5% of the universities responding already offered courses to the targeted students and that 67.7% would be interested in offering such a course. Only 2.5% indicated that they would not be interested in the course; 21.7% indicated that they were presently undecided. The most popular course configuration (76.1%) was a 2-3 day workshop (presumably to teach the specifics of a particular course). There

were also 35 schools (25.4%) who were interested in a 4-6 week mini-course and 26 (18.9%) who were interested in a full semester or quarter course. Nearly half of the respondents felt strongly that the course would contribute to the marketability of their graduates, 22.9% felt that it would not and 28.7% were undecided. Funding was seen as the major obstacle to course implementation by 82% of the universities responding.

IS&R EDUCATIONAL COURSES

The overwhelming majority of the universities responding (86.4%) indicated interest in incorporating a pre-packaged program into their curriculum when the course becomes available. The most frequently mentioned qualifications to incorporation were funding support (81.5%) and preevaluation of the course materials (69.2%). The most requested educational materials were course syllabi (73.5%) and hands-on usage assignments (65.2%). Lesson Plans (53.8%), Overhead Transparencies (55.3%), Homework Assignments (49.2%), Workbooks (60.6%), Textbooks (51.5%), Bibliographies (43.2%), Support Handouts (62.1%), and Videotapes/Films (47.7%) were all requested by over 40% of the respondents. Only Examinations (38.6%) and Discussion Topics (39.4%) were considered desirable by less than 40% of the respondents.

TRANSPORTABLE INFORMATION STORAGE AND RETRIEVAL SYSTEM COURSES
NEEDS ANALYSIS QUESTIONNAIRE

ANALYSIS RESULTS SUMMARY

POSITION OF RESPONDENT	ABSOLUTE FREQ	RELATIVE FREQ (%)
PRESIDENT, VICE-PRES	32	19.9
DEAN, ASST-DEAN	62	38.5
HEAD OF DEPT	21	13.0
FACULTY MEMBER	16	9.9
OTHER	30	18.6
TOTAL	161	100.0

PART 1 INFORMATION ABOUT THE UNIVERSITY

1.1 Educational Objectives

(Computer Usage)

PHYSICAL SCIENCES	ABSOLUTE FREQ	RELATIVE FREQ (%)
VERY IMPORTANT	38	28.8
IMPORTANT	52	39.4
DESIRABLE	29	21.9
OPTIONAL	2	1.5
NOT APPLICABLE	11	8.5

(SAMPLE SIZE, N = 132)

ENGINEERING	ABSOLUTE FREQ	RELATIVE FREQ (%)
VERY IMPORTANT	81	59.1
IMPORTANT	38	27.7
DESIRABLE	2	1.5
OPTIONAL	1	0.7
NOT APPLICABLE	15	10.9

(N = 137)

1.1 Educational Objectives

(Research Skills)

PHYSICAL SCIENCES	ABSOLUTE FREQ	RELATIVE FREQ (%)
VERY IMPORTANT	17	14.3
IMPORTANT	54	45.4
DESIRABLE	43	36.1
OPTIONAL	5	4.2

(N = 119)

ENGINEERING	ABSOLUTE FREQ	RELATIVE FREQ (%)
VERY IMPORTANT	12	10.1
IMPORTANT	46	38.7
DESIRABLE	55	46.2
OPTIONAL	6	5.0

(N = 119)

1.2 Computer Access

PHYSICAL SCIENCES	ABSOLUTE FREQ	RELATIVE FREQ (%)
ON-CAMPUS DEPT TERMINALS	94	79.7
OFF-CAMPUS REMOTE TERMINALS	28	23.7
OUTSIDE OF DEPT TERMINALS	80	67.8
PC IN DEPT	70	59.3
PC OUT OF DEPT	44	40.0

(N = 118)

ENGINEERING	ABSOLUTE FREQ	RELATIVE FREQ (%)
ON-CAMPUS DEPT TERMINALS	104	86.7
OFF-CAMPUS REMOTE TERMINALS	28	23.3
OUTSIDE OF DEPT TERMINALS	78	65.0
PC IN DEPT	80	66.7
PC OUT OF DEPT	42	35.0

(N = 120)

PART 2 IS&R SYSTEM USAGE

2.1 On-Line IS&R

	ABSOLUTE FREQ	RELATIVE FREQ (%)
YES	116	72.0
NO	40	24.8
UNDECIDED	5	3.1

(N = 161)

2.2 Systems Available To Departments

	ABSOLUTE FREQ	RELATIVE FREQ (%)
PHYS SCIENCE DEPTS-ALL	82	76.6
ENGINEERING DEPTS-ALL	73	68.2
ONLY SPECIFIC DEPTS	6	5.6
OTHER DEPTS	51	47.7

(N = 107)

2.3 Available Systems

	ABSOLUTE FREQ	RELATIVE FREQ (%)
BASIS	2	1.7
BROWSER	0	0.0
BRS	56	48.3
CAN/OLE	2	1.7
CAS	24	20.7
CGIS	1	0.9
CSIN	5	4.3
DATA CENTRAL	5	4.3
DIALOG	88	75.9
DTIC/DROLS	1	0.9
ENERGY/RECON	18	15.5
IGS	1	0.9
ISI	22	19.0
LEADER	0	0.0
MEDLINE	40	34.5
NASA/RECON	20	17.2
OCLC	54	46.6
ORBIT	42	36.2
PERGAMON/INFOLINE	9	7.8
QUESTEL	9	7.8

SPIRES	16	13.8
STAIRS	3	2.6
TIS	0	0.0
Inhouse System(s)	26	22.4
Other(s):	32	27.6
ALIS/IDS	2	1.7
ANL	1	0.9
BOEING INFO SYS	1	0.9
CYNET	1	0.9
DATA-TRIEVE (DEC)	1	0.9
D&B	1	0.9
DISCOVER	1	0.9
FAXON	1	0.9
GEOREF	1	0.9
ICTSR	1	0.9
LEXIS	3	2.6
RAMIS	1	0.9
RLIN	5	4.3
RTS	1	0.9
SIR	2	1.7
SYSTEM 1.72	1	0.9
SYSTEM 1032	1	0.9
TECH DATA	1	0.9
VUTEXT/DOW JONES	2	1.7
WESTLAW	2	1.7
NOT SPECIFIED	2	1.7

(N = 116)

2.4 Systems Available To Bodies

	ABSOLUTE FREQ	RELATIVE FREQ (%)
FACULTY	113	98.3
STAFF	104	90.4
STUDENT COURSEWORK	79	68.7
STUDENT RESEARCH	100	87.0
GENERAL STUDENT BODY	69	60.0
GENERAL PUBLIC	41	35.7

(N = 115)

2.5 Data Base Searching Advertised

	ABSOLUTE FREQ	RELATIVE FREQ (%)
NEWSLETTERS	76	69.1
SEMINARS	46	41.8
NON-CREDIT COURSES	17	15.5
FOR-CREDIT COURSES	28	25.5
OTHER:	42	38.2
Brochures	7	6.4
Demos & Lectures by		
Library Staff	9	8.2
Fliers	2	1.8
Internal Memos	3	2.7
Posters	4	3.6
Through Reference Librarian	10	9.1
Word of Mouth	7	6.4

(N = 110)

2.6 Party Responsible for Online Searches

	ABSOLUTE FREQ	RELATIVE FREQ (%)
LIBRARIAN	110	94.8
OTHER STAFF	26	22.4
FACULTY	26	22.4
STUDENTS	10	8.6
ANY TRAINED INDIVIDUAL	21	18.1

(N = 116)

2.7 Funding Source(s)

	ABSOLUTE FREQ	RELATIVE FREQ (%)
USER	82	71.3
DEPARTMENT	74	64.3
UNIVERSITY	61	53.0
GRANT(S)/CONTRACT(S)	71	61.7
OTHER	13	11.3
Agreement With Owner	1	0.8
Cash by Non-affiliated User	2	1.7
Library	7	6.1
Not Specified	3	2.6

(N = 115)

PART 3 IS&R SYSTEM EDUCATIONAL NEEDS

3.1 Course Interest

	ABSOLUTE FREQ	RELATIVE FREQ (%)
YES	109	67.7
NO	4	2.5
UNDECIDED	35	21.7
PRESENTLY OFFERING	12	7.5

(N = 160)

3.2 Format(s)/Duration(s)

	ABSOLUTE FREQ	RELATIVE FREQ (%)
2-3 DAYS WORKSHOPS	105	76.1
4-6 WEEKS MINI-COURSES	35	25.4
FULL QUARTER COURSE	11	8.0
FULL SEMESTER COURSES	15	10.9

(N = 138)

3.3 Marketability

	ABSOLUTE FREQ	RELATIVE FREQ (%)
YES	76	48.4
NO	36	22.9
UNDECIDED	45	28.7

(N = 157)

3.4 Basis for Opinion

	ABSOLUTE FREQ	RELATIVE FREQ (%)
FAC STDNT ALUMNI NEEDS	36	47.4
POTENTIAL EMPLOYERS	29	38.2
GRANT EXPERIENCE	43	56.6
PROFESSIONAL LITERATURE	37	48.7
OTHER	9	11.8
ACS Meeting	1	1.3
Common Sense	1	1.3
Discussion With Colleagues	1	1.3
Librarian	1	1.3
Personal Experience	4	5.3
Not Specified	1	1.3

(N = 76)

3.5 Major Obstacles

	ABSOLUTE FREQ	RELATIVE FREQ (%)
DIVERSE DEPT NEEDS	54	35.8
LOGISTICAL PROBLEMS	47	31.1
MATERIALS AVAILABILITY	29	19.2
FUNDING AVAILABILITY	124	82.1
OTHER	33	21.9
Availability of Faculty	2	1.3
Availability of Resources	6	4.0
Cost	3	2.0
Crowded Curriculum	7	4.6
Faculty Inertia	3	2.0
Low Priority in Relation to		
Other Requirements	5	3.3
Unnecessary at Under-		
graduate Level	3	2.0
Uncertainty About True		
Generality of IS&R Systems	1	0.7
Not Specified	3	2.0
NONE	3	2.0

(N = 151)

PART 4 IS&R SYSTEM EDUCATIONAL COURSES

4.1 Incorporating IS&R Courses

	ABSOLUTE FREQ	RELATIVE FREQ (%)
YES	8	5.0
NO	20	12.4
QUALIFIED	131	81.4

(N = 159)

4.1 (cont'd) Qualification

	ABSOLUTE FREQ	RELATIVE FREQ (%)
UNIVERSITY INPUT	30	23.1
PRE-EVALUATION	90	69.2
ONSITE TRAINING	61	46.9
FUNDING SUPPORT	106	81.5
OTHER	17	13.1
Clear Demonstration of Real Value	1	0.8
Compatability With Present Resources	3	2.3
Consultation With Appropriate Officials	2	1.5
Determination of Student/ Faculty Interest	3	2.3
Non Credit Basis	3	2.3
Relative Importance With Other Courses	3	2.3
Not Specified	2	1.5

(N = 130)

4.2 Educational Materials

	ABSOLUTE FREQ	RELATIVE FREQ (%)
COURSE SYLLABI	97	73.5
LESSON PLANS	71	53.8
OVERHEAD TRANSPARENCIES	73	55.3
HOMEWORK ASSIGNMENTS	65	49.2
HANDS-ON USAGE ASSIGNMENTS	86	65.2
EXAMINATIONS	51	38.6
DISCUSSION TOPICS	52	39.4
WORKBOOKS	80	60.6
TEXTBOOKS	68	51.5
BIBLIOGRAPHIES	57	43.2
SUPPORT HANDOUTS	82	62.1
VIDEOTAPES/FILMS	63	47.7
OTHER	9	6.8
Abstracts	1	0.8
Computer Aided Instruction	4	3.0
Online Tutorials	3	2.3
Not Specified	1	0.8

(N = 132)

PART 5 COMMENTS

Specific Comments

	ABSOLUTE FREQ	RELATIVE (%)	FREQ
NO COMMENTS	136	84.5	
SPECIFIC COMMENTS	25	15.5	

(N = 161)

General Comments

	ABSOLUTE FREQ	RELATIVE (%)	FREQ
NO COMMENTS	137	85.1	
GENERAL COMMENTS	24	14.9	

(N = 161)

Summary Request

	ABSOLUTE FREQ	RELATIVE (%)	FREQ
NO REQUEST	65	40.4	
SUMMARY REQUEST	96	59.6	

(N = 161)

Mailing Request

	ABSOLUTE FREQ	RELATIVE (%)	FREQ
NO REQUEST	86	53.4	
MAILING LIST REQUEST	75	46.6	

(N = 161)

TRANSPORTABLE INFORMATION STORAGE AND RETRIEVAL SYSTEM COURSES

NEEDS ANALYSIS QUESTIONNAIRE

COMMENTS OF THE RESPONDENTS - SUMMARY

[The numbers in the parentheses are specific question numbers (if specified)]

This college has not given serious thought to this issue. However, as the institution expands its research capability, this activity may well become higher in priority.

All students own powerful personal computer DECPro350. Campus to be networked withen 18 months.

Funding both in terms of computer time and staff time is the main impediment to this type of instruction; we have provided a limited introduction to searching to a number of engineering classes over the past 12 years.

As with many other universities information retrieval from data bases such as those mentioned is usually for bibliographic information and is therefore handled by the library. If an undergraduate research methods course were offered then the students could be introduced to online information retrieval and it would not necessarily be limited to bibliographic information. However this course is not currently being considered within the department of Geology.

Determination of student/faculty interest and willingness to participate probably on a non-credit basis. (4.1)

Transportable instruction should be in the form of written materials, films, tapes, etc. that can be viewed by users when they feel it appropriate. The strongest motivation is need to know.

Departments are using our information retrieval system and many are providing instruction through library - we see instruction (formal & otherwise) as evolving on campus. If NASA supports instructional courseware on information retrieval then I would agree that colleges and universities would have low or no cost to users.

In discussing this questionnaire with my 10 department heads they felt that a very short briefing (2 to 3 hours) was more than ample to demonstrate the system; our faculty and staff have no

problem using it with such a briefing.

Physical science: These systems would be useful only for literature search; mainly graduate students and faculty would use them. I believe they would have minimal value for undergraduates.

I would rather see students spend time and effort on fundamentals of DEMS and records management than on specific bibliographic retrieval packages.

It might be more appropriate to incorporate learning these skills within the framework of advanced courses in the major discipline.

Materials should be available as tutorials - online to the most common mainframes eg IBM, CDC. (4.2) Outmoded learning tools for these computer materials. (4.2)

The questionnaire suggests that those planning the system are not familiar with modern use of computer databases. Some help from commercial designers would be advisable.

University has no funding at present to allow for extensive participation.

So far no interest in end-user training has been expressed. (3.5)
I would be interested in the design of the course. (4.1)

Clear demonstration of real value. (4.1)

Importance relative to other curriculum requirements. (4.1)

Could you please condense the content of the cover letter to a more clear statement of purpose. It was unclear to me as it is written.

Could this system be used to catalog abstracts from the engineering libraries in the system?

At the point when you decide to proceed you should contact dept. chairs.

We see a great need and usefulness in online searching of the literature. We are however extremely limited by the amount of available funding to do these searches. Secondary matters such as familiarity with search techniques could easily be overcome.

Most physical science majors are computer literate but only a small portion know how to retrieve information from a central data base.

To modify for own use (4.1). Except for introductory courses computer skills development should be incorporated in general course work (3.2). A model course would be a useful guideline for developing material for incorporation into our own courses. (4.1)

Once students have developed good computer habits in connection with their coursework, it is relatively easy for them to learn the protocol of user friendly software. Then we must make such software available and make students aware of the availability.

Compatibility with present resources. (4.1) Incorporate as part of another course.

CAI w/video disk overlays, such as DEC's IVIS System. (4.2)

At this time the continual state-of-the-art evolution involved in online database searching creates a time investment vs. return (on that time investment) problem for the end user as searcher. More important unless the end user is online 2-5 hrs/mo, there probably will be a problem performing cost effective searches. I realize that database suppliers might see some profit in this problem.

Curricula are full. Something must go if done as a course. (3.5) Computer Assisted Instruction modules would be useful if they could be placed on disks and used in micro-computers. (4.2)

Involvement of our own professionals. (4.2) We will be more actively responding to the Departmental requests as awareness with the implementation of a campus network over the next year or so. (3.1)

Discussions with other professional. (3.4)

Availability of interested faculty. (3.5) Will certainly increase competence. Not clear that increases their marketability. I think you should involve the library profession in your evaluation.

If these are in form for self-learning. (4.1)

Not generally. Some are available through the University Library, but I can not answer specific questions about these services. (2.1)

In a university of our size & diversity, only department heads know the answers to some of your questions.

As with other courses to be introduced, the question is where do we fit them; what do we eliminate?

Inertia. (3.5). Everyone here will have an IBM PC or PC/XT within 5 years. Software Acronyms are for too numerous for faculty to care about.

Faculty and students use the services but are not interested in doing retrievals themselves. (2) There should be a course in chemical literature. Most students and faculty are deficient in elementary skills with Chem. Abst. Training would even make them better clients. (3) I would be interested in the course development. (4)

Not a formal course but an optional seminar. (4.1)

Limited duration (<1 day) overview is envisioned. (4.1) Seminars or short workshops (< 1 day) would be sufficient exposure of overview material. Hands-on usage not necessary on campus. (3.2)

Is there space available in the program? (4.1)

TRANSPORTABLE INFORMATION STORAGE AND RETRIEVAL SYSTEM COURSES

NEEDS ANALYSIS QUESTIONNAIRE

Position of Respondent: _____

Institution Name: _____

Address: _____

Note: Throughout the questionnaire, if more than one answer to a question is applicable, please check all that apply.

PART 1

INFORMATION ABOUT THE UNIVERSITY

1.1 Different universities place emphasis on different educational objectives. The following is a brief list of possible objectives that may or may not be stressed by your university.

For each group, please check the response corresponding to how important an item is for a senior undergraduate student within your university in Physical Sciences and Engineering.

Computer Usage

Physical
Sciences

Engineering

- | | |
|--|-----|
| ___ Very important (e.g., more than 2 classes required) | ___ |
| ___ Important (e.g., 1 to 2 classes required) | ___ |
| ___ Desirable (e.g., not required, but highly recommended) | ___ |
| ___ Optional (at the student's discretion) | ___ |
| ___ Not applicable | ___ |

Research Skills

- | | |
|---|-----|
| ___ Very Important (e.g., Baccalaureate Thesis required) | ___ |
| ___ Important (e.g., formal training in research techniques required) | ___ |
| ___ Desirable (e.g., no formal training, but some skills expected) | ___ |
| ___ Optional | ___ |

1.2 Which of the following describe the access of students in Physical Sciences and Engineering departments to computing facilities?

Physical
Sciences

Engineering

- ___ Terminals in the department used to access a computer located on the campus ___
- ___ Terminals in the department used to access a remote computer not on the campus ___
- ___ Terminals located in some other location outside of the department ___
- ___ Personal computer workstations located in the department ___
- ___ Personal computer workstations available for use but not located in the department ___

PART 2

INFORMATION STORAGE AND RETRIEVAL SYSTEM USAGE

2.1 Are online information storage and retrieval systems available for use by students at your university?

YES

NO

UNDECIDED

(If "NO", please skip this section and go to PART 3)

2.2 To which departments are these systems available?

- ___ All Physical Sciences departments
- ___ All Engineering departments
- ___ Only specific Physical Sciences and/or Engineering departments: Please specify which departments

- ___ Other departments: Please specify which departments

2.3 Which systems are available?

- | | | |
|---------------------------------------|---------------------------------------|--|
| <input type="checkbox"/> BASIS | <input type="checkbox"/> DTIC/DROLS | <input type="checkbox"/> PERGAMON/INFOLINE |
| <input type="checkbox"/> BROWSER | <input type="checkbox"/> ENERGY/RECON | <input type="checkbox"/> QUESTEL |
| <input type="checkbox"/> BRS | <input type="checkbox"/> IGS | <input type="checkbox"/> SPIRES |
| <input type="checkbox"/> CAN/OLE | <input type="checkbox"/> ISI | <input type="checkbox"/> STAIRS |
| <input type="checkbox"/> CAS | <input type="checkbox"/> LEADER | <input type="checkbox"/> TIS |
| <input type="checkbox"/> CGIS | <input type="checkbox"/> MEDLINE | <input type="checkbox"/> Inhouse system(s) |
| <input type="checkbox"/> CSIN | <input type="checkbox"/> NASA/RECON | <input type="checkbox"/> Other(s): |
| <input type="checkbox"/> DATA CENTRAL | <input type="checkbox"/> OCLC | <input type="checkbox"/> Please specify: |
| <input type="checkbox"/> DIALOG | <input type="checkbox"/> ORBIT | _____ |
| | | _____ |
| | | _____ |

2.4 Are these systems available to:

- ☐ Faculty
- ☐ Staff
- ☐ Students for coursework
- ☐ Students for research
- ☐ The general student body
- ☐ The general public

2.5 How is the availability of database searching advertised?

- ☐ Newsletters
- ☐ Seminars
- ☐ Non-credit courses
- ☐ For-credit courses
- ☐ Other: Please specify: _____

2.6 Select the person(s) responsible for conducting online searches at your university:

- ☐ Librarian
- ☐ Other staff
- ☐ Faculty
- ☐ Students
- ☐ Any trained individual

2.7 What funding source(s) are used to pay for the services?

- ☐ User
- ☐ Department
- ☐ University
- ☐ External Grant(s)/Contract(s)
- ☐ Other: Please specify: _____

PART 3

INFORMATION STORAGE AND RETRIEVAL SYSTEM EDUCATIONAL NEEDS

3.1 Would your university be interested in offering your Physical Sciences and Engineering students an opportunity to learn the principles and concepts of online information storage and retrieval systems, to understand the types of scientific and engineering database services that are available, and to interact with such systems and services?

YES

NO

UNDECIDED

ALREADY OFFERING PRECISELY SUCH COURSES

3.2 What format(s)/duration(s) do you feel such an educational program should take?

- ☐ 2-3 days workshops
- ☐ 4-6 week mini-courses
- ☐ Full quarter courses
- ☐ Full semester courses

3.3 Do you feel that formal education in these areas, coupled with hands-on experience with one or more major online retrieval systems such as NASA/RECON, would appreciably increase the professional marketability of your graduating scientists and engineers?

YES

NO

UNDECIDED

3.4 If your answer to the preceding question was "YES", did you base your opinion on:

- ☐ Needs expressed by faculty, students and/or alumni?
- ☐ Requirements expressed by potential employers of your graduates?
- ☐ Experience gained through participation in research grants and/or contracts?
- ☐ Knowledge gained through professional literature?
- ☐ Other: Please specify: _____

3.5 What do you foresee as the major obstacles toward teaching and utilizing information storage and retrieval systems more extensively at your university?

- ☐ Diverse departmental needs
- ☐ Logistical problems
- ☐ Availability of comprehensive course materials
- ☐ Availability of funding
- ☐ Other: Please specify: _____
- ☐ None

PART 4

INFORMATION STORAGE AND RETRIEVAL SYSTEM EDUCATIONAL COURSES

4.1 When transportable information storage and retrieval system courses are available, would your university be interested in incorporating the pre-packaged educational program into your Physical Sciences and/or Engineering curricula?

YES

NO

QUALIFIED: Consideration would be contingent upon:

- ☐ The university's opportunity for input into the development phases of the courses
- ☐ The possibility of pre-evaluation of all course materials
- ☐ The availability of onsite seminars, demonstrations and/or teaching assistance
- ☐ The possibility of funding support for system access costs
- ☐ Other: Please specify: _____

4.2 Which of the following educational materials would you like to see incorporated within the transportable course packages:

- | | |
|---|---|
| <input type="checkbox"/> Course syllabi | <input type="checkbox"/> Discussion topics |
| <input type="checkbox"/> Lesson plans | <input type="checkbox"/> Workbooks |
| <input type="checkbox"/> Overhead transparencies | <input type="checkbox"/> Textbooks |
| <input type="checkbox"/> Homework assignment
(with answer keys) | <input type="checkbox"/> Bibliographies |
| <input type="checkbox"/> Hands-on usage assignments
(with answer keys) | <input type="checkbox"/> Support handouts |
| <input type="checkbox"/> Examinations
(with answer keys) | <input type="checkbox"/> Videotapes and/or films |
| | <input type="checkbox"/> Other: Please specify:

_____ |

PART 5
COMMENTS

Thank you very much for completing this questionnaire.

If you wish to add any comments about any of the specific questions asked, please feel free to do so.

Question
Number

Comments

—	_____

—	_____

—	_____

—	_____

General Comments:

If you would like to receive a summary of this survey and/or more information about the contract activities, please check the following items:

- ___ Would like to receive a summary of the results of this survey.
- ___ Would like to be placed on our mailing list for dissemination of information related to the contract activities.

ATTACHMENT 3.1

**COURSE DEVELOPMENT PHASE:
STANDARDIZED COURSE MATERIAL
DOCUMENTATION TEMPLATES**

STANDARDIZED COURSE MATERIAL DOCUMENTATION TEMPLATES

STANDARDIZED COURSE SYLLABUS TEMPLATE

- COURSE NAME:** Identification of the name of the course.
- OBJECTIVES:** Specification of the primary objectives of the course in terms of the information and/or experience to be imparted to students of the course.
- PREREQUISITES:** Specification of the basic prerequisites expected of prospective students of the course.
- SCHEDULING:** Specification of the duration of the course in terms of the number and type of instructor/student contact hours and/or laboratory hours.
- COURSE FORMAT:** Specification of the types of instructional formats to be employed in the course.
- REQUIREMENTS:** Specification of the requirements of the students in the course in terms of homework assignments, hands-on RECON usage assignments, examinations, and so on. For graded courses, percentage of final grade associated with each requirement is also specified.
- COURSE OVERVIEW:** Detailed specification of the major topics to be addressed within the course; breakdown of major topical areas into specific component subjects to be addressed; and specification of instructional duration for each major topical area.
- REQUIRED READINGS:** Specification of alternative required reading material and/or text(s) for the course.

POTENTIALLY REQUIRED READINGS: Specification of the types of reading material that may potentially be required within the course, depending upon instructor prerogative and/or availability of system (RECON) and data base documentation.

REFERENCE BIBLIOGRAPHY: Identification of the reference bibliography provided to support the course.

STANDARDIZED LESSON PLAN TEMPLATE

COURSE NAME: Identification of the name of the course.

LESSON NAME: Identification of the name of the lesson.

LESSON OBJECTIVE: Identification of the primary objectives of the lesson in terms of the information to be presented to the student within this lesson.

MEDIA AND EQUIPMENT: Identification of the presentation media and equipment to be used as part of presenting this lesson.

REFERENCES: Identification of the specific reference material to be employed in the preparation for, and presentation of this lesson.

METHOD OF PRESENTATION: Identification of the specific method(s) of instruction to be employed in the presentation of this lesson.

LENGTH OF LESSON: Identification of the number of instructional hours to be devoted to this lesson.

LEARNING OBJECTIVES: Identification of the specific learning objectives associated with this lesson in terms of the specific capabilities that the student will gain as a result of having taken this lesson.

PLAN FOR CONDUCTING THE LESSON: Identification of the major topical areas to be covered within this lesson; the order of their presentation; and the amount of time to be devoted to each such area.

ASSIGNMENTS: Identification of the specific out-of-class assignments associated with this lesson. Such assignments may include reading assignments, homework assignments, and/or RECON usage assignments, as appropriate.

STANDARDIZED HOMEWORK ASSIGNMENTS TEMPLATE

LEARNING OBJECTIVES: Textual description of the motivation for performing this homework assignment and the learning objectives associated with the assignment.

ASSIGNED TASKS: Identification of the specific tasks to be performed as part of this homework assignment.

STANDARDIZED HOMEWORK ASSIGNMENTS ANSWER KEY TEMPLATE

ASSIGNED TASKS: Reiteration of the specific tasks to be performed as part of this homework assignment.

ANSWERS: Statement of correct answers to each assigned task/question.

STANDARDIZED USAGE ASSIGNMENTS TEMPLATE

LEARNING OBJECTIVES: Textual description of the motivation for performing this RECON usage assignment and the learning objectives associated with the assignment.

ASSIGNED TASKS: Identification of the specific tasks to be performed using RECON as part of this usage assignment.

STANDARDIZED USAGE ASSIGNMENTS ANSWER KEY TEMPLATE

ASSIGNED TASKS: Reiteration of the specific tasks to be performed using RECON as part of this usage assignment.

ANSWERS: For each assigned task, the full text of a series of user/system RECON interactions which results in the correct answer(s) to that task.

STANDARDIZED EXAMINATION TEMPLATE

BASIC CONTROL DATA: Identification of basic examination control data, e.g., type of examination (midterm, final, etc.), format of examination (open book, closed book, etc.), duration of examination, etc.

LESSON IDENTIFICATION: Identification of the course lesson(s) relevant to each question on the examination, to ensure coverage of the examination across all lessons comprising the course.

QUESTIONS: Statement of the questions comprising the examination.

STANDARDIZED EXAMINATION ANSWER KEY TEMPLATE

BASIC CONTROL DATA: Identification of basic examination control data (as above).

QUESTIONS: Reiteration of the questions comprising the examination.

ANSWERS: Statement of correct answers to each question.

VISUALS OBJECTIVES / GUIDELINES

- (1) The collection of course visuals will represent a complete and comprehensive presentation of the topical areas defined within the course syllabus.
- (2) The collection of course visuals will provide the framework whereby a qualified instructor can effectively teach the course utilizing the associated course syllabus, lesson plans, etc.
- (3) The collection of course visuals will provide the information necessary to enable a conscientious student to obtain a college-level understanding of the course material and to demonstrate this understanding as evidenced by acceptable performance on the course assignments and examination(s).

ATTACHMENT 3.2

**COURSE DEVELOPMENT PHASE:
COURSE DEVELOPMENT STANDARDS
FOR VISUALS OUTLINES**

USL/DEMS NASA/RECON
VISUALS OUTLINE STANDARDS

March 27, 1984

OUTLINE FORMAT

Major section titles must be capitalized and positioned to start in the left margin. Indentation should be five spaces at each hierarchical level. The outline must be single spaced with one blank line between major section and subsequent entries, no blank line between subheadings and sub-subheadings. Line length must be standard runoff line length (.11 65). An example is shown in the Appendix, and the reader should use the example as a guideline to follow when preparing his or her visuals outline(s) for the NASA/RECON project.

FEATURE ANALYSIS OF INTERACTIVE INFORMATION STORAGE AND RETRIEVAL
SYSTEMS

User Categorizations

- System Administrators
- Data Base Administrators
- Applications Programmers
- Information Specialists
- End Users
- Parametric Users

Data Models

- Hierarchical Data Model
- Network Data Model
- Relational Data Model
- Flat File Model

Logical Data Structures

- Item Level
- Group Level
- Record Level
- File Level
- Data Base Level

Physical Storage Structures

- Data Representation Considerations
- Data Characteristics Considerations
- Device Characteristics Considerations
- Storage Structuring and Accessing Techniques

Data Base Definition

- Data Definition
- Data Relationships Definition
- Data Value Integrity Constraints
- Data Indexing
- Data Base Definition Languages

Data Base Interrogation/Searching

- Basic Selection Constructs
- Index Searching vs. Data File Searching
- String Matching Options
- Existence Checking
- Compound Conditions
- Data Base Searching Languages

- Data Base Report Generation
 - Online vs. Offline Report Generation
 - System Default Report Formats
 - User-Defined Report Formats
 - Alternate Output Formats
 - Report Generation Languages
- Data Base Update
 - Update Operations
 - Update Modes
 - Update Data Formats
 - Update History Files
 - Update Utilities
 - Update Access Control
 - Data Base Update Languages
- Data Base Redefinition
 - Logical Data Structure Redefinition
 - Physical Storage Structure Redefinition
 - Redefinition Facilities
 - Data Base Redefinition Languages
- Administrative Functions
 - System Administrator Functions
 - Data Base Administrator Functions
- Data Base Security Considerations
 - Authentication
 - Authorization
 - Privacy/Security Transformations
 - Security Logging
- Performance Measurement and Evaluation
 - System Execution Efficiency Orientations
 - User Interface/Interaction Orientations
 - PME Tools and Techniques
 - Privacy Considerations

BIBLIOGRAPHIC DATA BASE DESIGN

- Bibliographic Data Items/Fields
- Bibliographic Record Formats
- Document Files
- Index Files
- Thesaurus Files
- Sample Search Files
- User Profile Files

BIBLIOGRAPHIC FILE STRUCTURES

Linear File Organizations

List Structured File Organizations

- Multi-List Files
- Inverted Files

Clustered File Organizations

- Cluster Generation
- Cluster Definition
- Cluster Searching

VOCABULARY CONTROL

Controlled Vocabularies

- Pre-Controlled Vocabularies
- Post-Controlled Vocabularies

Free Text Approaches

Thesaurus Support

- Broader Terms
- Narrower Terms
- Synonyms
- Abbreviations
- Related Terms

BIBLIOGRAPHIC DATA BASE SEARCHING

Types/Levels of Search Languages

- Procedural, Host-Language-Based Languages
- Self-Contained, Structured Query Languages
- Procedure Definition and Invocation Languages
- Interactive, Prompting-Oriented Languages
- Batch, Forms-Oriented Languages
- Interactive, Forms-Oriented Languages
- List/Menu Selection Languages
- Restricted Natural Languages
- Unrestricted Natural Languages
- Integrated Combinations of the Above

Search Formulation Features

- Search Field Control
- Single Term Searching
- Phrase Searching

Term Proximity Searching
Term Range Searching
Root Searching/Suffix Strip/Prefix Strip Searching
Substring Searching
Dictionary Searching
Thesaurus Searching
Relational Operation Usage
Logical (Boolean) Operation Usage
Request Sets/Search Sets
Search Profiles/Saved Search Strategies
Search Review

Output Generation Features
Online/Offline Output Generation
Pre-Defined Output Formats
User-Defined Output Formats
Rapid Scan
Expanding
Highlighting
Sorting
Ranking

Instructional/Diagnostic Features
Online System Documentation
Online Data Base Documentation
Online Training
Error Diagnostic Facilities
Sample Searches
Search Logic Tracing

ADDITIONAL IS&R APPLICATION AREAS

Selective Dissemination of Information (SDI) Systems and
Current Awareness Systems
Support For Personal Files
Interfaces With Document Delivery Systems

IS&R PERFORMANCE MEASUREMENT AND EVALUATION

Phases of the PME Life Cycle
Identification of Generic Evaluation Objectives
Identification of Detailed Measurement Parameters
Selection of Measurement Mechanisms
Identification of Required Data Analyses
Design/Conduct of Data Collection Experiments
Conduct of Data Analysis/Evaluation Activities

Identification of Desired Improvements/Enhancements
 Implementation of Identified Enhancements
 Repetition of Cycle as Dictated by Objectives

Traditional, Obtrusive User Monitoring

Controlled Usage Experiments
 Use of Human Subjects
 Subjective User Assessments
 Recall and Precision Analysis
 Failure Analysis
 Data Base Coverage Analysis

Advanced, Unobtrusive User Monitoring

Quasi-Controlled Usage Experiments
 Unobtrusive Software Monitoring Facilities
 System Usage Profile and Data Base Usage Profile
 Analysis
 Timing Analysis
 User Error and Error Recovery Analysis
 Direct and Surrogate Measures of User Success
 Automated Statistical Data Analysis
 Trend Analysis/Projection Analysis

FUTURE INFORMATION STORAGE AND RETRIEVAL SYSTEMS

Assessment of Current State-of-the-Art
 Identification of Current Research Trends
 Projection of Future System Capabilities

ATTACHMENT 3.3

**COURSE DEVELOPMENT PHASE:
COURSE DEVELOPMENT STANDARDS
FOR VISUALS**

N A S A

N A S A

USL/DBMS NASA/RECON
VISUALS DEVELOPMENT STANDARDS

Frank Y. Chum
Suzy Gallagher

Computer Science Department
University of Southwestern Louisiana
P. O. Box 44330
Lafayette, Louisiana 70504

March 27, 1984

V I S U A L S

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S T A N D A R D S

USL/DEMS NASA/RECON
VISUALS DEVELOPMENT STANDARDS

The purpose of this document is to establish the set of standards for the USL/DEMS NASA/RECON visuals development activity in order to maintain a consistent format for the visuals.

The set of visuals submitted should consist of the following:

COVER PAGE

Each set of visuals should have a title cover page for the topic covered in the visuals. The cover page for the set of visuals should have the title, centered, and all in capital letters. Since the final product of each set of visuals will be printed on the laser printer with a large type font, you must restrict the number of characters per line to not more than thirty-five for the title lines of the cover page as well as the title lines on each visual.

TABLE OF CONTENTS

After the cover page, the next set of pages must be a table of contents (using as many pages as necessary to identify the titles of every section that will subsequently occur in the set of visuals). The table of contents must correspond to the visuals outline with respect to section titles. An example is shown in the Appendix. Notice that the titles of all sections are included in appropriate upper and lower case. All textual lines (i.e., all lines other than title lines) on all visuals must be restricted to a maximum of 50 characters per line, including leading blanks or indentation. Your runoff segments should use ".11 50".

SECTION FORMAT

The first page of each section must be a section cover page formatted identically to the visuals cover page. All subsequent visuals pages must have a descriptive title line(s). All title lines are centered and capitalized. If a visual is a continuation of the previous visual, then the visual title line should be the same as that of the previous visual with a following "(cont'd)" entry.

There should never be more than twenty lines per visual. Divide the contents of each visual carefully. Make your best judgement of where you should break page to the next visual without disrupting the flow of continuity, or, on the other hand, without trying to force everything onto one visual.

The level of detail presented in each visual should be considered carefully. Avoid lengthy descriptions or wordy presentations of concepts. Keep descriptions concise and compact. List your topics out one by one without clustering them into paragraphs. Keep your audience in mind when you define the level of details or abstractions. Avoid duplication of material that is to be presented in another section. Remember that a picture is worth a thousand words. Use Graphics, Diagrams, Charts, Drawings, Cartoons, etc. to catch attention and for aesthetic purposes. Provide as many examples as possible to illustrate the concepts in a clear and precise manner.

The rule for indentation of lines is as follows. Generally, each hierarchical level of concepts should be indented five spaces. This can be best illustrated in the example presented in the Appendix of this document. This scheme will work up to three hierarchical levels of indentation. After three levels, you will run out of space (with a line length of 50), unless each line is only a few words long. If the material absolutely requires more

than three hierarchical levels, you should determine the appropriate indentation scheme, for example, two space indentation if absolutely necessary.

The format of capitalization and line spacing should be observed from the example given in the Appendix. You must keep in mind that the visuals will be produced on the laser printer with a considerably larger type font than that on the line printer. Double spacing is the minimum spacing between two lines (do not use single spacing).

Do not use page numbering, headers, footers, or any other special runoff facilities. All of these will be supplied later by a tailored post-processor to ensure consistency across all sets of visuals.

For each visual that naturally provides a hook to a system-specific example or discipline-specific example, include, as the last line(s) on the visual, either or both of the following statement:

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

These statements must not be "hard-coded" in your runoff segments but rather inserted via use of runoff ".if" commands. The insert files can be found in the ">udd>CMPS669C2>VISUALS" directory.

N A S A

N A S A

Their names are:

"NASA.V.system_example.runoff"

"NASA.V.discipl_example.runoff".

V I S U A L S

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S T A N D A R D S

*
*
* DISTRIBUTION CONSIDERATIONS *
*
* IN *
* DISTRIBUTED DATA PROCESSING *
*

DISTRIBUTION CONSIDERATIONS
IN
DISTRIBUTED DATA PROCESSING

TABLE OF CONTENTS

Considerations for Distribution of Data

Considerations for Distribution of DEMS Functions

*
*
*
*
*
*
*
*
*
*

CONSIDERATIONS
FOR
DISTRIBUTION OF DATA

CONSIDERATIONS FOR DISTRIBUTION OF DATA

*** Data Base Size and Structuring :

*** Number of records (logical and Physical)

*** Average number of data item values per
record

*** Number of key items

*** Number of key values per key item

*** Minimum, maximum, and average record
length

*** Minimum, maximum, and average data item
length by data item

*** Minimum, maximum, and average key value
length by key item

*** Total size of data files by data item
and by record-level

*** Total size of indices by key item(s)

*** Total size of directories

CONSIDERATIONS FOR DISTRIBUTION OF DATA (cont'd)

*** Relative Frequency of Data Base Activities :

*** Generic level :

*** Search / Retrieval activity

*** Output activity

*** Maintenance activity

*** Detail level :

*** Search / Retrieval activity by
search type by data item / key item

*** Output activity by output type by
data item

*** Maintenance activity by Add /
Delete / Update type by data item

*** Search / Retrieval, output, and
maintenance activity by record-level
operations

*** Relative Complexity of Data Base Activities

*** Relative Order of Activity Execution

CONSIDERATIONS FOR DISTRIBUTION OF DATA (cont'd)

*** Statistics Characterizing Activity Execution :

*** CPU time duration

*** I/O time duration or paging activity

*** Real time duration

*** Other resource utilization requirements

And, of course, Statistics characterizing the
storage devices and processing
capabilities available at each
node.

```

*****
*
*
*
*      CONSIDERATIONS
*
*
*      FOR
*
*
*      DISTRIBUTION OF DEMS FUNCTIONS
*
*
*****

```

CONSIDERATIONS FOR DISTRIBUTION OF DEMS FUNCTIONS

*** Size of System Code, by Module

*** Size of Required System Buffers, by Module

*** Relative Frequency of Execution of System
Code, by Module

*** Statistics Characterizing Execution of
System Code, by Module :

*** CPU time duration

*** I/O time duration or paging activity

*** Real time duration

*** Other resource utilization requirements

*** Chronological and Parallel Ordering of
Module Executions

*** Calling Sequence of Module Executions

N A S A

N A S A

VISUALS DEVELOPMENT STANDARDS

PHASE II

Suzy Gallagher

V I S U A L S

- 9 -

S T A N D A R D S

General Guidelines

Do not use complete sentences as part of the visuals, some examples do require this construction but the plan is to make the visuals skeletal.

Use specific terms rather than general ones where possible, if a term is technical or obscure, refer it to Instructor Notes WITH AN APPROPRIATE DEFINITION.

Abbreviations

The only acceptable abbreviation is IS&R for Information Storage and Retrieval System. Other abbreviations will not be used; this is the customary standard for technical writing.

Indentation

The standard indentation is 5 spaces per level.

Title

Please use ".sp 16" to space the star boxes at the start of each section.

Capitalizing

Each word will begin with a capital letter except minor prepositions and articles.

Example: Pointers to Documents

Stars

Each topic line will be marked by three stars followed by two spaces.

Example: *** Like This

Parentheses

No parenthetical expressions will be used; when this temptation strikes either

1. Use sub-categories, or
2. Migrate the material to Instructor Notes.

Runoff

All material is to be written using runoff; do not attempt to indent without using this facility. This leads to problems when editing is necessary since your carefully measured lines will change shape.

A hint: When formatting tables, etc. which require the material to be lined up in columns use the ".tr" instruction and insert the when a space is needed, this prevents runoff from formatting your material.

N A S A

N A S A

Spelling

Please make use of the runoff wordlist facility to check your spelling, the command is "ec >potluck>wl <segment_name>.runoff".

V I S U A L S

S T A N D A R D S

ATTACHMENT 3.4

**COURSE DEVELOPMENT PHASE:
FIRST DRAFT OF PROPOSED INTEGRATED
OUTLINE OF COURSE VISUALS**

I N S A I

DEVELOPMENT

MANUAL VERSUS AUTOMATED RESEARCH METHODS

Conventional Research Tools

- Reference Tools
- The Card Catalogue
- Library Organization

Information Science

- Manual System
 - Library
- Computerized System
 - Data Base
- Manual Search vs. Computerized Search
 - Finding Indices
 - Coordinating
 - Sampling
 - Output
 - Review
- Advantages of Online Search
- Disadvantages of Online Search
- Information Storage and Retrieval
 - Producers
 - Processors
- Data Base Composition
 - Document File
 - Index Files

FEATURE ANALYSIS OF INTERACTIVE INFORMATION STORAGE AND RETRIEVAL SYSTEMS

User Categorization

Rationale

- Differing User Requirements
- System Orientations Toward Multiple User Categories

Categorization Parameters

- User Background
- User Experience
 - Present System
 - Other Systems
 - General Computer
- User Job Functions

Category Definition

Functional

- System Administrators
- Data Base Administrators
- Applications Programmers
- Information Specialists
- End Users
- Parametric Users

Casual Users

Data Models

- Basic Concepts of Data Models

- Hierarchical Data Model

- Network Data Model

- Relational Data Model

- Flat File Model

- Similarities and Differences Between Data Models

Logical Data Structures

- Logical Data Structure vs Physical Storage Structure

 - Logical Data Structure Concepts

 - Physical Storage Structure Concepts

- Data Structure Levels

 - Item Level

 - Group Level

 - Record Level

 - File Level

 - Data Base Level

- Data Structure Hierarchy

Physical Storage Structures

- Data Representation

 - Word Size

 - Word Format

 - Character Representation

 - Numeric Representation

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Data Independence

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- Document Files
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- Unordered Sequential File
- Ordered Sequential File

Indexed File Organizations

- Indexed Sequential File
- Indexed Non-sequential File

List Structured File Organizations

- Singly Linked List
- Doubly Linked List
- Inverted List File
- Multi-list vs. Inverted List

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- Simple Network and Complex Network

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- Cluster Generation
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- Co-relation Matrix
 - Reduction
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- Clustering Tradeoffs
 - Advantages
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 - Brief Review of Bibliographic IS&R System Languages
 - Information Content
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 - Usage
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 - Brief Description of all System Commands
 - Brief Description of all Error Diagnostic Messages
 - On-line Data Base Documentation
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 - On-line Training
 - Provision of System Tutorials for the New User
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 - Rationale
 - Feedback to the System Designers
 - Foundations for System Evaluation

ADDITIONAL IS&R APPLICATION AREAS

- Selective Dissemination of Information (SDI) Systems
 - Maintains Bibliographic Data of Specific Discipline
 - Personal Service
 - Machine Aided Information
 - User Profiles Constructed
 - Profiles Periodically Modified
 - Search Strategy
 - Automatic Feedback
- Support for Personal Files
 - Files for Specific Projects
 - Small Number of References
 - User Specification of Data Base Features
 - Combination of Bibliographic and Data Management Characteristics
- Combined Retrieval Systems
 - Interconnection of Information Facilities
 - Common Interface
 - Common Command Language

User Freed from Different Command Languages

Personal Computing Environments

- Personal Computer Access to Remote IS&R System
- Data Retrieved into Personal Computer Storage
- Characteristics
- Functions
- Users
- Prestored Procedures
- Security

Interfaces with Document Delivery Systems

- Microform storage
 - No Rewriting / No Erasing
 - Paper Copy Produced on Demand
 - Random Access
 - Data Viewed on Special Reading Equipment
- Video Disks
 - Large Data Stored
 - No Rewriting
 - Mailed to Users
 - Pitfalls

IS&R PERFORMANCE MEASUREMENT AND EVALUATION

Phases of the PME Life Cycle

Ten Phases

- Identify Generic Evaluation Objectives
- Identify Specific Evaluation Objectives
- Identify Detailed Measurement Parameters
- Select Evaluation Mechanisms
- Identify Evaluation Tools
- Identify Data Analysis and Data Presentation Tools
- Design and Conduct Data Collection Experiments
- Identify Desired Improvements/Enhancements
- Implement Identified Enhancements
- Repeat Cycle as Dictated by Objectives

Categorizations of Generic/Specific Objectives

Measurement Parameters at Different Levels

User Level

- Logical Data Base Design Level
- Logical Data Base Organization Level
- Physical Storage Organization Level
- Underlying Machine Level

Types of Parameters

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- Subjective Parameters

Selection of Evaluation Mechanisms

Evaluation Tools

Models

- Analytic Models
- Simulation Models

- Queueing Models
- Abstract Data-Flow Models
- Algorithm Analysis
- Benchmarks and Synthetic Programs
- Hardware/Firmware Monitors
- Software Monitors
- Questionnaires, Evaluation Forms, Checklists,
- User Comments, Personal Observation
- Data Analysis Tools
 - Frequency Distributions
 - Descriptive Statistics
 - Bivariate/Multivariate Analysis
 - Tests of Significance
 - Regression Analysis
 - Analysis of Variance
 - Markov Analysis
- Data Presentation Tools
 - Graphic Representations
 - Tables of Results
- Design and Conduct of Experiments
- Acting on Evaluation Results
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- Traditional Obtrusive User Monitoring
 - Basic Concepts
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 - Interference with Interaction
 - Controlled Usage Experiments
 - Design Decisions
 - Grouping Subjects
 - Control of Environment
 - Generalizability to Real World
 - Use of Human Subjects
 - Psychological Considerations
 - Variability Control
 - Confidentiality Considerations
 - Subjective User Assessments
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 - Recall and Precision Analysis
 - Recall
 - Measures Completeness of Retrieval Set
 - Determinability Problems
 - Precision
 - Determines Relevancy of Retrieval Set
 - Determinability Problems
 - Recall/Precision Inverse Relationship
 - Usefulness in Controlled Experiments
 - Failure Analysis
 - Correlation to Recall and Precision Analysis
 - Analyze Indexing
 - Analyze User Search Strategy
 - Feedback for System Improvements

- Data Base Coverage Analysis
 - Compare Data Base Content to all Relevant Information
 - Data Base Administrator Responsibilities

- Advanced Unobtrusive User Monitoring

- Basic Concepts

- Transparent to User
 - No Interference With Interaction

- Quasi-Controlled Usage Experiments

- Subject Grouping
 - Definition of Tasks
 - Limited Control of Environment

- Unobtrusive Software Monitoring Facilities

- Parameters

- User Error and Error Recovery Data
 - Timing Data
 - Retrieval Logs

- Characteristics

- Levels of Transparency
 - Necessity of Validation

- Software Engineering Techniques

- Characteristics
 - Application to Data Base Systems

- System Usage Profile Analysis

- Parameters

- Commands and Features Used
 - Data Bases Utilized

- Patterns of Usage

- Identification of Typical Patterns
 - Deviations from Patterns

- Usage Analysis

- Determine User Proficiency
 - Measure Learnability
 - Measure Usability

- Timing Analysis

- System Response Times

- Time/Cost Analysis

- Real Time

- CPU Time

- User Response and Think Times

- User Error and Error Recovery Analysis

- Limitations

- Measurement of Logical Errors Restricted
 - Lack of Information on User Motivation

- Parameters

- Number of Errors
 - Types of Errors
 - Context of Errors
 - Use of Help Commands

- Recovery

- Decrease in Incidence of Similar Errors
 - Successful Subsequent Searches

- Utilization of Results

Modification of System
Modification of Data Base
Future Design Decision-Making

FUTURE INFORMATION STORAGE AND RETRIEVAL SYSTEMS

Languages for Retrieval

- Common Command Languages
- Natural Languages
- Special Character Languages
- Multiple Purpose Languages

Alternative User Interfaces

- Graphics Displays
- Graphics Input Devices
- Voice / Text Recognition
- TV and Video Interfaces

PC Environments

- Intelligent Terminals
- PC-Based Interfaces
- Automated Hookups
- Multi-System Access
- Local Processing

Knowledge Based Systems

- Intelligent Gateways
- Common Command Languages
- Query Optimizations
- User Advising
- Intelligent Diagnostics
- Knowledge Representations
 - Frames
 - Rules
 - Transition Networks
- Processing
 - Traditional
 - Commercial Products
 - Special Cases

Distributed and Network Systems

- Network Configurations
- Network Sizes
- Hardware
- Software
- Local Data Bases
- Local / Remote Processing

ATTACHMENT 3.5

**COURSE DEVELOPMENT PHASE:
FIRST DRAFT OF PROPOSED
COURSE VISUALS**

I N S A I

DEVELOPMENT

COURSE OVERVIEW

Manual Versus Automated Research Methods

Feature Analysis of Interactive Information
Storage and Retrieval Systems

Bibliographic Data Base Design

Bibliographic File Structure

Vocabulary Control

Bibliographic Data Base Searching

Additional IS&R Application Areas

IS&R Performance Measurement and Evaluation

Future Information Storage and Retrieval
Systems

SYSTEMS APPLICATIONS

NASA/RECON

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*
*      MANUAL   VS   AUTOMATED
*
*      RESEARCH  METHODS
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*
*          CONVENTIONAL
*
*    RESEARCH  TOOLS
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Library Organization

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*** Word Meanings

*** Examples

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Acronyms; Initialisms and
Abbreviations Dictionary

*** Thesauri

*** Alternative Terms

*** Synonyms

*** Encyclopedia

*** Basic Information

*** Brief Articles

*** Coverage

*** General Knowledge

*** Example

The Encyclopedia Britannica

*** Specific Field

*** Example

The Encyclopedia of Computer
Science

REFERENCE TOOLS (CONT'D)

*** Periodical Indices

*** Serial Publications

*** Current Literature

*** Level of Coverage

*** Specific Subjects

*** Examples

The Engineering Index

Biological and Agricultural Index

*** General Interest

*** Example

Readers' Guide to Periodical
Literature

*** Abstract Policy

*** Included

*** Examples

Chemical Abstracts

Current Index to Journals
in Education

*** Omitted

*** Examples

General Science Index

Index to IEEE Publications

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

REFERENCE TOOLS (CONT'D)

*** Government Publications

*** Government Documents Indices

*** General Indices

*** Examples

Cumulative Title Index to U. S.
Public Documents

Index to U. S. Government
Periodicals

United States Government
Publications Monthly Catalogue

*** Department Indices

*** Examples

Index to GAO Documents

American Statistics Index

Scientific and Technical Aerospace
Reports

*** Indexed Material

*** Government Contracts

*** Research Reports

*** Government Depositories

*** 1,355 Sites

*** Free Material

*** Continual Updates

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

REFERENCE TOOLS (CONT'D)

*** Citation References

*** A Backward Search Tool

- *** Finds Sources Used by Researchers
- *** Indicates Authorities
- *** Establishes Historical Perspective
- *** Examples
 - Science Citation Index

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

THE CARD CATALOGUE

*** Types of Cards

*** Author

*** Title

*** Subject

*** Data on Cards

*** Call Number

*** Author

*** Title

*** Publisher

*** Subjects

*** Series

*** Paging

*** Special Information

*** Illustrations

*** Tables

*** Gazetteer

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

THE CARD CATALOGUE (CONT'D)

*** Call Numbers

*** Dewey Decimal System

*** Small Collections

*** Limited Flexibility

*** Library of Congress System

*** Large Collections

*** Easily Extensible

*** More Complex

LIBRARY ORGANIZATION

*** Shelf Arrangement

*** Open Stacks

*** Physically Grouped

*** Encourages Browsing

*** Closed Stacks

*** Limits Access

*** Improves Security

*** Floor Plan

*** Example

Library of School

*
* INFORMATION RETRIEVAL *
* USING COMPUTERS *
*

INFORMATION RETRIEVAL USING COMPUTERS

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Online Searching

Information Systems

RETRIEVAL SYSTEMS

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*** Manual Systems

*** Library

*** Random Access

*** Browsing

*** Slow

*** Available to All Users

*** Restricted to One User at a
Time

*** Computerized System

*** Data Base

*** Completeness

*** Special Skills Required

*** Simultaneously Available

*** Fast

RETRIEVAL SYSTEMS (CONT'D)

*** Manual Search vs. Computerized Search

*** Finding Indices

*** Library

*** Search Card Catalogue

*** Search Reference Books

*** Online Systems

*** Display Thesaurus

*** Search Index

*** Coordinating

*** Sampling

*** Output

*** Review

ONLINE SEARCHING

*** Advantages of Online Search

*** Speed

*** Completeness

*** Accessability

*** Cost

*** Flexibility

*** Currency

ONLINE SEARCHING (CONT'D)

*** Disadvantages of Online Search

- *** Cost
- *** Limited Historical Content
- *** Complexity
- *** Variety
- *** Range of Data Base

ONLINE SEARCHING (CONT'D)

*** Data Bases

- *** Centralized Control of Data
- *** Redundancy Reduced
- *** Independence of Data
- *** Integrity Insured
- *** Inconsistency Avoided
- *** Standards Enforced
- *** Data Shared
- *** Security Checked

ONLINE SEARCHING (CONT'D)

*** Data Bases (cont'd)

*** Producers

*** Types

*** Professional Associations

*** Government Agencies

*** For Profit Organizations

*** Products

*** Printed Indices

*** Machine Readable Data Bases

*** Processors

*** Commercial Services

*** In House Development

*** Government Services

ONLINE SEARCHING (CONT'D)

- *** Data Bases (cont'd)
 - *** Multidisciplinary
 - *** Document Specific
 - *** Journals
 - *** Reports
 - *** Proceedings
 - *** Unidisciplinary
 - *** Sciences
 - *** Technology
 - *** Social Sciences
 - *** Humanities
 - *** Patents
 - *** News
 - *** Law
 - *** Medicine
 - *** Others

ONLINE SEARCHING (CONT'D)

*** Some Data Bases and Producers

*** AGRICOLA

*** National Agricultural Library (US Gov)

*** BIOSIS REVIEW

*** BioSciences Information Service

*** CA SEARCH

*** CA CONDENSATES

*** Chemical Abstract Source

*** ENERGY DATABASE

*** U.S. Department of Energy

*** ENERGYLINE

*** ENVIROLINE

*** ENVIRONMENTAL IMPACT STATEMENTS

*** Environment Information Center

ONLINE SEARCHING (CONT'D)

*** Some Data Bases and Producers (cont'd)

*** INSPEC

*** Institute of Electrical Engineers

*** MEDLINE

*** National Library of Medicine

*** METADEX

*** American Society for Metals

*** POLLUTION ABSTRACTS

*** Data Courier, Inc

ONLINE SEARCHING (CONT'D)

*** Data Base Composition

*** Document File

*** Index Files

INFORMATION SYSTEMS

*** Information Systems

*** DBMS

*** Numeric Information

*** Designed for Managers

*** IS&R

*** Bibliographic Data

*** Current Awareness

*** Professional Literature

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*                                     *  
*           FEATURE ANALYSIS         *  
*               OF                   *  
*    INTERACTIVE INFORMATION          *  
* STORAGE AND RETRIEVAL SYSTEMS      *  
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*                   CATEGORIZATION                       *
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CATEGORIZATION RATIONALE

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* * * Interface/User Matching

* * * Experimental Groupings

CATEGORIZATION RATIONALE (CONT'D)

* * * Parameters

* * * Background

* * * Job Functions

* * * Computer Expertise

* * * Experience

* * * Generalized Information Systems

* * * Specific System

CATEGORIZATION RATIONALE (CONT'D)

* * * Categories

- * * * System Administrators
- * * * Data Base Administrators
- * * * Application Programmers
- * * * Information Specialists
- * * * End Users
- * * * Parametric Users
- * * * Casual Users

CATEGORY

DEFINITIONS

CATEGORY DEFINITIONS

- *** System Administrators
 - *** Maintain the Data Base System
 - *** Manage System Software
 - *** Supervise System Installation
 - *** Provide Monitoring Tools
 - *** Enhance System Performance
 - *** Provide Consultation Services

CATEGORY DEFINITIONS (CONT'D)

- *** Data Base Administrators
 - *** Maintain Individual Data Base
 - *** Provide Structure and Information Content of the Data Base
 - *** Provide Security and Integrity Controls for the Information in the Data Base
 - *** Provide Liaison Between End Users and Application Programmers
 - *** Monitor and Evaluate Data Base Performance
 - *** Provide Feedback to the System Administrator

CATEGORY DEFINITIONS (CONT'D)

*** Application Programmers

*** Provide Extensions to the Data Base
System

*** Develop New Applications

*** Modify Existing Applications

*** Provide User Access Interfaces

CATEGORY DEFINITIONS (CONT'D)

*** Information Specialists

*** Act as Intermediary for End Users

*** Familiar with a Particular Set of Information

*** Provide Information for Data Base

*** Provide Indexing for Information

CATEGORY DEFINITIONS (CONT'D)

*** End Users

- *** Use Data Base Information in Job Functions
- *** Use Access Interfaces Defined by Applications Programmers
- *** Have Wide Variance in Expertise
- *** May Rely Totally of Information Specialist

CATEGORY DEFINITIONS (CONT'D)

*** Parametric Users

*** Invoke Pre-Defined Procedures

*** System-Initiated Dialogue

*** Input Information Requested by
System

*** System Function Invoked by Input

*** Interact with a Data Base in a Routine
Manner

CATEGORY DEFINITIONS (CONT'D)

*** Casual Users

*** Infrequent and Erratic System Use

*** Unwilling to Learn Formal Languages

*** Prompting-Oriented Interface

DATA MODELS

DATA MODELS

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Flat File Data Model

Hierarchical Data Model

Network Data Model

Relational Data Model

Comparison of Data Models

*
*
* BASIC CONCEPTS OF DATA MODELS *
*

BASIC CONCEPTS OF DATA MODELS

*** Data Models

*** Represent the Logical Organization of
the Data in the Data Base

*** Data Base

*** Collection of Entities

*** Entity

*** Collection of Data Items

*** Data Items

*** Smallest Logical Unit of the
Data Base

BASIC CONCEPTS OF DATA MODELS (CONT'D)

*** Data Models (cont'd)

*** Represent Relationships between Data

*** One_to_One Relationships

*** One_to_Many Relationships

*** Many_to_Many Relationships

BASIC CONCEPTS OF DATA MODELS (CONT'D)

*** Data Models (cont'd)

*** Data Non-Redundancy

*** Data Redundancy

*** Redundancy Elimination

*** Store Relationships Rather
Than Duplicated Data Values

*** Data Consistency

*** Data Sharing

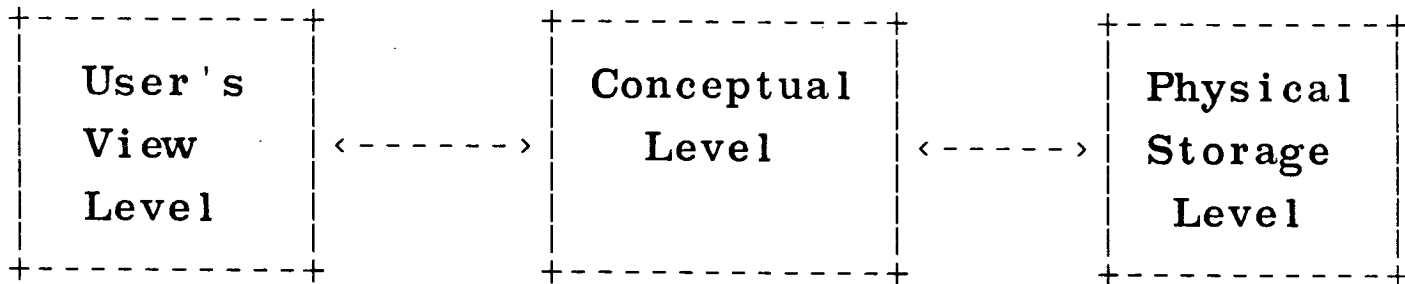
BASIC CONCEPTS OF DATA MODELS (CONT'D)

*** Data Models (cont'd)

*** Data Independence

*** Logical Data Independence

*** Physical Data Independence



BASIC CONCEPTS OF DATA MODELS (CONT'D)

*** Four Primary Models

*** Flat File Data Model

*** Hierarchical Data Model

*** Network Data Model

*** Relational Data Model

*
*
* FLAT FILE DATA MODEL *
*
*

FLAT FILE DATA MODEL

- *** Simplest Data Model
 - *** Pre-Data Base Organization
 - *** Commonly Used in File Processing
- *** Logical Units
 - *** Data Item
 - *** Record Type

*
*
* HIERARCHICAL DATA MODEL *
*
*

HIERARCHICAL DATA MODEL

*** Tree structures

*** Nodes

*** Represent Records

*** Root Record

*** Dependent Records

*** Arcs

*** Represent a Link Between Two Nodes

*** One_to_Many Relationships

*** Parents

*** Children

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* NETWORK DATA MODEL
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NETWORK DATA MODEL

*** Network Structures

*** N : M Relationships

*** One_To_Many Relationships

*** Many_To_Many Relationships

*** Owners

*** Members

*** Sets

*** Data Base Task Group

*
*
* RELATIONAL DATA MODEL *
*

RELATIONAL DATA MODEL

*** Representation of Relations

*** Tables

*** Attributes

*** Tuples

*** Collection of Data Items

*** No Duplicates

*** Unique Identifier

*** Primary Key

*** Order of Data Items

Insignificant

*
* COMPARISON OF DATA MODELS *
*

COMPARISON OF DATA MODELS

*** Relational Model

- *** Supports Hierarchical Structures
- *** Supports Network Structures
- *** Simple
 - *** Ease of Understanding
 - *** Based on Theory of Relations
 - *** High Degree of Data Independence
 - *** Supports High-Level Query Languages
 - *** Two Dimensional Representation
 - *** No Explicit Owner / Member Links

*** Network Model

- *** Supports Hierarchical Structure
- *** Supports Many_to_Many Relationships

COMPARISON OF DATA MODELS (CONT'D)

*** Hierarchical Model

*** No Support for Many_to_Many
Relationships

*** Subset of Network Model

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*
*          LOGICAL
*
*        DATA STRUCTURE
*
*****

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LOGICAL DATA STRUCTURE

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Data Types

Data Structures

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*
*      DATA   TYPES
*
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DATA TYPES

- *** Logical Representation of Data
- *** Data Types
 - Integer Alphanumeric
 - Character Real
 - Boolean
- *** Data Value Length
- *** Data Value Range

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*      DATA   STRUCTURES
*
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DATA STRUCTURES

*** Scalar

*** A Single, Indivisible Unit of Data

*** Array

*** Homogeneous Set of Data Values

*** Multi-Valued Data Items

DATA STRUCTURES (CONT'D)

*** Stack

*** Input and Output at One End

*** Last-In-First-Out Order

*** Queue

*** Input and Output at Different Ends

*** First-In-First-Out Order

*** Linked List

*** Link / Pointer

*** Relating Two Data Values

*** Null Link Field

DATA STRUCTURES (CONT'D)

*** Tree Structure

*** Root Node

*** Only One Root Node

*** No Entering Branch

*** Non-Root Nodes

*** Only One Entering Branch For Each
Non-Root Node

*** Paths

DATA STRUCTURES (CONT'D)

*** Network Structure

*** Each Element May Connect to Every Other
Element

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PHYSICAL
STORAGE STRUCTURE

PHYSICAL STORAGE STRUCTURE

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Device Characteristics

Storage Structuring Techniques

Accessing Techniques

DATA
REPRESENTATION

DATA REPRESENTATION

- *** Computer Word
 - *** Basic Unit of Physical Data
 - *** Word Size
 - *** Length of a Word in the Storage Medium
- *** Physical Representations of Data
 - *** Character Codes
 - *** Numeric Representations
 - *** Null Value Representation
 - *** Default Value
 - number ----- zero
 - character --- blank
 - pointer ----- nil

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DEVICE
CHARACTERISTICS

DEVICE CHARACTERISTICS

*** Access Modes

*** Physical Mapping of Data and Devices

*** Sequential Mode

*** Tape

*** Direct Mode

*** Disk

*** Drum

*** Addressability

*** Addressable Unit of the Storage Medium

Bit Byte

Word Block

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STORAGE STRUCTURING
TECHNIQUES

STORAGE STRUCTURING TECHNIQUES

- *** Sequential Structure
 - *** Records in Consecutive Storage Locations
- *** Indexed Structure
 - *** Keys
 - *** Primary Key
 - *** Secondary Key
 - *** Index
 - *** Primary Index
 - *** Secondary Index

STORAGE STRUCTURING TECHNIQUES (CONT'D)

- *** Physical Representation of Tree
 - *** Sequential Organization
 - *** Tree Directory Organization
 - *** Link Organization
- *** Physical Representation of Network
 - *** Combination of Sequential and Link Organization
 - *** Network Directory Organization

*
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ACCESSING TECHNIQUES

ACCESSING TECHNIQUES

- *** Sequential Search
 - *** Serial Search
 - *** Block Search
 - *** Binary Search
- *** Indexed Search
- *** Linked List Search
- *** Direct Accessing
 - *** Simple Direct Accessing
 - *** Hashing Method
 - *** Advantages
 - *** Fast Access
 - *** May Not Need Index Storage

* * * * *
*
* DATA BASE DEFINITION *
*
* * * * *

DATA BASE DEFINITION

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Model Definition

Submodel Definition

Objectives of Model / Submodel Separation

Data Base Elements Definition

Data Base Definition Languages

MODEL DEFINITION

* * * Schema

* * * CODASYL Terminology

* * * Complete Description of Information in
the Data Base

SUBMODEL DEFINITION

*** Subschema

*** CODASYL Terminology

*** Description of Subset of The Data Base

*** Accessed by Application Programmers or
Users

OBJECTIVES OF MODEL / SUBMODEL SEPARATION

- *** Ensure Data Base Privacy
- *** Ensure Data Base Integrity
- *** Provide Specific User Views
- *** Data Independence

DATA BASE ELEMENTS DEFINITION

- *** Data Item Names
- *** Data Value Integrity Constraints
 - *** Data Types
 - *** Sets of Valid Values
 - *** Ranges of Valid Values
 - *** Data Values
 - *** Unique
 - *** Duplicated
 - *** User Supplied Data Validation Procedures
- *** Data Grouping and Interrelationships
- *** Data Ordering Relationships
- *** Data Access Locks
 - *** Passwords
 - *** Access Control List
 - *** User Supplied Access Validation
 Procedures
- *** Data Indexing

DATA BASE DEFINITION LANGUAGES

- *** Define Data Base Elements
- *** Define Relations Between Occurrences in the Data Base

*
* DATA BASE *
*
* INTERROGATION / SEARCHING *
*

DATA BASE INTERROGATION / SEARCHING

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Basic Selection Constructs

Index Searching And Free Text Searching

String Matching Options

Existence Checking

Logical Combination

Data Base Searching Languages

*
*
* SEARCHING CYCLE *
*

SEARCHING CYCLE

*** Logging In

*** Ways to Access the Systems

*** Direct Lines

*** Phone Lines

*** Networks

*** Identify System to be Used

*** Logging Procedure

*** Establish Communications

*** Identification

*** User

*** Terminal Type

*** Security Check

*** Accounting Check

*** System Newsletter

SEARCHING CYCLE (CONT'D)

*** Logging In (cont'd)

*** Considerations

*** System Dependent

*** Installation Dependent

*** Type of Contract Dependent

*** Other Factors

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

SEARCHING CYCLE (CONT'D)

*** Selecting Files

*** Searching Only One Data Base
at a Time

*** Merging Results If Possible

*** Specifying a Data Base

*** Default Data Base

*** System Default

*** User Group Default

*** User Default

SEARCHING CYCLE (CONT'D)

*** Entering Commands

*** Instruction to the System

*** Format of a Command

{VERB} {OBJECT}

OBJECT = {OPERAND} | {OBJECT <OPERATOR>
OBJECT}

*** Select Term(s)

*** Combine Sets

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

SEARCHING CYCLE (CONT'D)

*** Displaying Results

*** Selecting a Format

*** Default

*** Complete Record

*** Partial Output

Accession Number

Abstract

Author

Year ...

Any Combination

*** Order

Chronological

Alphabetic

Sort On a Key

SEARCHING CYCLE (CONT'D)

*** Online Output

*** Faster but More Expensive

*** Offline Output

*** Cheaper but Slower

*** Mailed Printing

*** Accounting and Other Details

*** Mailed Materials/
Ordering Documents

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

SEARCHING CYCLE (CONT'D)

*** Logging Out

*** Freeing the Disks

*** Temporary Sets Are Lost

*** Unsaved Search Strategies Lost

*** Leaving the System

*** Reminder of Time Used

*** Reminder of Output Requested

*** Cost of Session

*** Comments

*
* BASIC *
* SELECTION CONSTRUCTS *
*

BASIC SELECTION CONSTRUCTS

*** Matching Terms

*** Relational Expressions

⟨OPERAND⟩ ⟨Boolean Operator⟩ ⟨OPERAND⟩

*** Boolean Operator

*** OPERANDS

*** Data Base Entity Names

*** Character Strings

⟨SET1⟩ AND ⟨"CHEMISTRY"⟩

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

BASIC SELECTION CONSTRUCTS (CONT'D)

*** Selecting Terms

*** Start Search by Selecting Term(s)

*** Locate Term in Dictionary

EXPAND <Term>

*** Presence of Term

*** Number of Hits

*** Other Related Terms

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

BASIC SELECTION CONSTRUCTS (CONT'D)

*** Forming a Set

SELECT <Term>

*** System Counts All Occurrences of <Term>
*** Set is Formed

Number Assigned to the New Set

↓
V

(System): 1 25 <Term>

↓
V

Number of Hits ("Posting")

*** Specialized Format

*** Select One Field Only

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

BASIC SELECTION CONSTRUCTS (CONT'D)

*** Combining Terms

*** Boolean Logic

*** Group Similar Concepts

*** Eliminate Unrelated Terms

*** SELECT <Term1>

SELECT <Term2>

COMBINE 1 AND 2

*** COMBINE <Term1> AND
<Term2>

*** Combine Set(s) With
Set(s)

Set(s) With Term(s)

Term(s) With Set(s)

Term(s) With Term(s)

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

BASIC SELECTION CONSTRUCTS (CONT'D)

*** Creating a Search Strategy

*** Guidelines for Effective Queries

*** Build Queries While Offline

* * * Narrow Down Search Early

* * * Select Relevant Concepts

* * * High Recall

*** All Relevant Ones

*** High Precision

* * * Only Relevant Ones

*** Eliminate Implicit Queries

*** * * HOOK TO SYSTEM-SPECIFIC EXAMPLE * * ***

BASIC SELECTION CONSTRUCTS (CONT'D)

- *** Polishing the Process Online
 - *** Refine Strategy
 - *** Modify Queries
- *** Getting Output
- *** User's Satisfaction
 - *** Iterative Process of Searching
 - *** Requiring User/System Interaction
 - *** Iterative Sequence
 - *** Browsing
 - *** Selecting
 - *** Retrieving
- *** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

BASIC SELECTION CONSTRUCTS (CONT'D)

*** Retrieving References

*** Online Viewing

*** Offline Printing

*** Flexibility of Format vs. Ease of Use

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

*
* INDEX SEARCHING *
* AND *
* FREE TEXT SEARCHING *

INDEX SEARCHING AND FREE TEXT SEARCHING

*** Index Searching

*** Controlled Vocabulary

*** The Indexer

*** Time Delay

*** Subjectivity

*** Selection of Terms Time
Dependent

INDEX SEARCHING AND FREE TEXT SEARCHING (CONT'D)

*** Index Searching (cont'd)

*** Advantages

*** Speed of Search

*** Retrieve Subject-Related References

*** Broad Concepts Can Easily Be
Searched

*** Hierarchical Concepts

*** Concepts With Many
Possible Names

*** Ease of Use

*** Printed Material Available

*** Entry Vocabulary

*** Indicates Postable Term

*** Automatic Substitution

*** Recognize Homographs

*** Weight Search Terms

*** Priority Based Search

INDEX SEARCHING AND FREE TEXT SEARCHING (CONT'D)

*** Index Searching (cont'd)

*** Disadvantages

- *** Limited to Pre-Defined List of Terms
- *** Difficult to Retrieve Precise Terms If Not Indexed
- *** New Interest in a Term
- *** Different Spelling
- *** Time Discrepancy
- *** Handling of Compound Terms
 - *** Individual Terms
 - *** List of Terms
 - *** Combination of the Two
- *** Time Inconsistencies Within Many Data Bases

INDEX SEARCHING AND FREE TEXT SEARCHING (CONT'D)

*** Index Searching (cont'd)

*** Constraints of Usage

*** Complete Indexing

*** Subject Well-Defined

*** Controlled Vocabulary

INDEX SEARCHING AND FREE TEXT SEARCHING (CONT'D)

*** Free Text Searching

*** Uncontrolled Vocabulary

*** Necessary for Abstract and Text
Search

*** Matching

INDEX SEARCHING AND FREE TEXT SEARCHING (CONT'D)

*** Free Text Searching (cont'd)

*** Advantages

*** Ease of Use

*** Ordinary Words

*** No Need for Index Terms

*** No Need to Master Thesauri

*** No Need to Master
Classification Techniques

*** Retrieval of Terms Not in
Controlled Language

*** Retrieval of Obscure Material

*** Completeness, when Term not Indexed

*** Accuracy, Hit a Specific Term

*** Immediate Availability

*** Complete Availability

*** Several Data Bases Can Be Searched
With Minor Modifications

*** Search Save Procedures Simplified

*** Allows Proximity Search

INDEX SEARCHING AND FREE TEXT SEARCHING (CONT'D)

*** Free Text Search (cont'd)

*** Disadvantages

- *** Slower and More Expensive

- *** No General Concepts

- *** Can Lead to Ambiguity

- *** Inconsistency of Rules

INDEX SEARCHING AND FREE TEXT SEARCHING (CONT'D)

*** Free Text Searching (cont'd)

*** Constraints of Usage

*** No Precise Index Term Can Be
Selected

*** Uncontrolled Vocabulary

*
* STRING MATCHING *
* OPTIONS *

STRING MATCHING OPTIONS

*** Phrase Searching in Dictionary

*** Exact Match

*** Word for Word

*** Substring Match

*** Partial Matching

*** Root Match

*** Search on a Root

*** Prefix Match

```

                                { DATA
DAT ===> { DATE
                                { DATING
```

STRING MATCHING OPTIONS (CONT'D)

*** Universal Match Character

*** Replacing a Final Character

*** Replacing One Embedded Character

 { COMPETE
COMP?TE ==> { COMPUTE

*** Replacing Many Embedded Characters

COMP?? ==> { COMPACT
 { COMPUTER

* * * * *

* *

* EXISTENCE *

* *

* CHECKING *

* *

* * * * *

EXISTENCE CHECKING

*** Term Existence

*** Problem from Boolean Logic

*** Negative Answer To a Confusing Query

*** Null Terms

*** Value of a Null Term

*** Search for Patents

*** Research

*** Publications

*** Copyright Issues

*
* LOGICAL *
* COMBINATIONS *
*

LOGICAL COMBINATIONS

*** Boolean Logic

*** Simple Conditions

*** Union

*** Intersection

*** Negation

LOGICAL COMBINATIONS (CONT'D)

*** Union

*** Operators

*** OR

*** +

*** Result

*** Enlarge Set

*** Sum of Operands

*** Example

Engineers OR Chemists

Produces a set of people who are either
Engineers or Chemists.

LOGICAL COMBINATIONS (CONT'D)

*** Intersection

*** Operators

*** AND

*** *

*** Result

*** References Containing a Combination
of Terms

*** Narrow Set Definition

*** Example

Engineers AND Chemists
Produces a set of people who are both
Engineers and Chemists.

LOGICAL COMBINATIONS (CONT'D)

*** Negation

*** Operators

*** NOT

*** -

*** Result

*** Reduce Set

*** Set Difference

*** Example

Engineers NOT Chemists

Produces a set of people all of whom are
Engineers and none of whom are Chemists.

LOGICAL COMBINATIONS (CONT'D)

*** Exclusive OR

*** Not Always Available

*** Engineers XOR Chemists

Produces a set of people who are either
engineers or chemists but not both.

LOGICAL COMBINATIONS (CONT'D)

*** Priority

*** Order of Operations

*** Affects Result

*** System Dependent

*** Example

1 Parentheses

2 NOT

3 AND

4 OR

LOGICAL COMBINATIONS (CONT'D)

* * * Compound Conditions

A and B or C and D not E and F
(A and B) or (C and D) not (E and F)

LOGICAL COMBINATIONS (CONT'D)

*** Other Logics

*** Weighted Terms

*** Assign Weight to Each Search Term

*** Select a Threshold Value

*** Fractional Search

*** Enter a String of Terms

*** Output Ranked According to Presence of Terms

*** Natural Search

*** Examples

SMART

LEADER

BROWSER

* * * * *
*
* DATA BASE *
* SEARCHING LANGUAGE *
* * * * *

DATA BASE SEARCHING LANGUAGES

*** Historical Overview

*** First IS&R Experiments

*** 1964: TIP (MIT)

*** First Large Scale Online Retrieval System

*** 1965: NASA/RECON

National Aeronautics and Space

Administration/REmote CONtrol

Designed by Lockheed Missiles and Space Company

Later Designers of DIALOG

DATA BASE SEACHING LANGUAGES

*** Historical Overview (cont'd)

*** First Widely Used Service

*** 1971: MEDLINE

MEDLARS on LINE

National Institute of Health

National Library of Medicine

Designed by System Development
Corporation

Later Designers of ORBIT

*** First Full Text Applications:

*** 1960's: Data Central

Designed by Mead

Legal Data Bases and Other Full
Text Search

OBAR, LEXIS, NEXIS, LEXPAT

DATA BASE SEARCHING LANGUAGES (CONT'D)

- *** Some Online Searching Software Systems
- *** BASIS (Battelle Memorial Institute)
- *** INQUIRE (Infodata System Inc.)
- *** STAIRS (IBM)

DATA BASE SEARCHING LANGUAGES (CONT'D)

*** Some Commercial Processors

*** BRS

(Bibliographic Retrieval Services
Inc.)

*** DIALOG

(Lockheed Information Systems)

*** LEXIS

(Mead Data Central)

*** ORBIT

(System Development Corporation)

*** WESTLAW

(West Publishing Company)

** Some Governmental Processors

*** NASA/RECON

(National Aeronautics and Space
Administration)

*** MEDLINE

(National Library of Medicine)

DATA BASE SEARCHING LANGUAGES (CONT'D)

- *** Comparison of Systems
 - *** Many Search Languages Available
 - *** Constantly Changing
 - *** Languages Perform Different Functions
 - *** Equivalent Commands Are Not Identical
 - *** Differences
 - *** Data Base Structures
 - *** System Defaults
 - *** User Needs

*
*
* DATA BASE REPORT GENERATION *
*

DATA BASE REPORT GENERATION

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System Default Report Format

User-Defined Report Formats

Alternate Output Formats

Report Generation Languages

*
*
* SYSTEM DEFAULT REPORT FORMAT *
*

SYSTEM DEFAULT REPORT FORMAT

- *** Contents
 - *** Chosen by System
 - *** Dependent on Application
- *** Predetermined
 - *** Minimum Spacing Factor between Elements
 - *** First Physical Print Position
 - *** Line Size
 - *** Page Size
- *** Column Width Equals Either
 - *** Length of Data
 - *** Length of Column Header
- *** Horizontal Report Format
- *** Headings Centered
- *** Underlined at Proper Places
- *** Sorted in First Column

SYSTEM DEFAULT REPORT FORMAT (CONT'D)

*** Example 1

Page 1

STATEMENT SHOWING EMPLOYEE STATUS

Current Position	Employee Number	Employee Name
Account Rep	2345	Susan Jones
Analyst	4875	Robert Norman
Data-Base Designer	1245	Frank Smith
Network Spec	2765	Kirk Williams
Operator	3275	James Gary
Security Expert	1564	Phil Collins
Software Spec	2875	Anne Martin

System Default Report Format

SYSTEM DEFAULT REPORT FORMAT (CONT'D)

* * * Example 2

REFERENCE CODE: 78

JOURNAL: COMPUTER DECISIONS

VOLUME: 8

ISSUE: 1

DATE: JANUARY 1976

PAGES: 56 - 60

TITLE: KEYS TO DBMS SECURITY

AUTHOR(S): BURNS, K. J.

AFFILIATION: CINCOM SYSTEMS, INC.

ABSTRACT: LEGISLATIVE AND SOCIETAL PRESSURES ARE FORCING DP MANAGERS TO RESTRUCTURE THE SECURITY OF THEIR DATA BASES. THE BIG QUESTION EACH MUST ASK IS, 'WHO IS SITTING AT THE TERMINAL?'

KEYWORDS: DATA BASE ARCHITECTURE,
SECURITY-ENHANCING FEATURE

CATEGORIES: 4.22 * 4.33

*
*
* USER-DEFINED REPORT FORMATS *
*
*

USER-DEFINED REPORT FORMATS

- *** Report Content
 - *** Select Data Elements
 - *** Choose Strings
 - *** Compute Values
 - *** Counts
 - *** Sub Totals
 - *** Totals
 - *** Title and Header Suppressed on New Page
 - *** Choice of
 - *** Default Title
 - *** User Chosen Title

USER-DEFINED REPORT FORMATS (CONT'D)

*** Data Editing Formats

*** Specifications

- *** Line Size
- *** Page Size
- *** Spacing Factor
- *** Underlining
- *** Header Width
- *** Header Centering
- *** Maximum Pages
- *** Left / Right Justification

USER-DEFINED REPORT FORMATS (CONT'D)

- *** User Created Formats Library
 - *** Data Editing Formats
 - *** Stored in Library
 - *** Called by Simple Commands
 - *** Macros Defined
 - *** Library Commands
 - *** Invoked for Desired Display of Report
 - *** Modified for Changing Demands

USER-DEFINED REPORT FORMATS (CONT'D)

*** Example 1

Page 1

Employee Status Statement

Department	Employee Number	Employee Name	Salary	Status	E F K
Accounts	0115	Gary, Sobers	30,000	Sr. Manager	
	0124	Lloyd, Clive	22,000	Accountant	
	0678	Robert, Andy	20,000	Acct Clerk	
Data Processing	1345	Kanhai, Rohan	31,255	Network Sp	
	1567	Landry, Steve	27,755	Sr. Analyst	
	1875	Peter, Joe	25,550	Programmer	

User-Defined Output Format

```

*****
*
*
*   ALTERNATE OUTPUT FORMATS
*
*
*****

```

ALTERNATE OUTPUT FORMATS

- *** Printed as Binary Output Files
- *** Computer Output to Microfilm
- *** Graphical Displays:
 - *** Histograms
 - *** Plots
 - *** Bar charts
 - *** Pie charts
 - *** Frequency Charts

*
*
* REPORT GENERATION LANGUAGES *
*

REPORT GENERATION LANGUAGES

- *** Language Commands Facilitate
 - *** Formatting
 - *** Report Headers
 - *** Footnotes
 - *** Titles
 - *** Rearranging Records
 - *** Erasing
 - *** One or More Rows
 - *** One or More Columns
 - *** Setting
 - *** Line Spacing
 - *** Line Size
 - *** Page Size
 - *** Setting Output Destination
 - *** High Speed Printer
 - *** Disk
 - *** Terminal

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

*
* DATA BASE UPDATE *
*

DATA BASE UPDATE

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Update Operations

Update Data Formats

Update Modes

Update History Files

Update Conflict Control

UPDATE OPERATIONS

*** Recognize Changes to Be Made

*** Add

*** Delete

*** Change

*** Check All Factors

*** Update All Stored Copies

*** Update All Stations in Network

*** Perform Update

UPDATE OPERATIONS (CONT'D)

*** Adding New Values:

*** Example

INSERT BOOK TITLE IS "COMPUTER DATA BASE
ORGANIZATION" AUTHOR IS "MARTIN, JAMS"
PUBLISHER IS "PRENTICE-HALL, INC" PRICE IS
\$38.50 SUBJECT IS "DATA BASE LOGICAL AND
PHYSICAL DESIGN".

*** Deleting Existing Values:

*** Example

DELETE BOOK TITLE IS "SPACE" AUTHOR IS
"MICHENER, JAMES".

*** Changing Existing Values:

*** Example

CHANGE AUTHOR TO "MARTIN, JAMES" FOR BOOK
TITLE "COMPUTER DATA BASE ORGANIZATION".

UPDATE DATA FORMATS

*** Predefined

*** Example

CHANGE price to 33.00

*** Computed

*** Example

CHANGE price to price * 1.1

UPDATE MODES

*** Unconditional Update:

*** Example

GET record number 1 CHANGE book price.

*** Conditional Update:

*** Example

IF BOOK TITLE = "COMPUTER DATA BASE
ORGANIZATION" AND AUTHOR = "MARTIN, JAMES"
THEN CHANGE BOOK PRICE.

UPDATE HISTORY FILES

*** Transaction Log

*** Record of Transaction

*** Before Image

*** Roll Back

*** After Image

*** Roll Forward

*** Audit Trail

*** Record of Accesses

*** Record of Activities

UPDATE CONFLICT CONTROL

*** Multiple User Update Problem

*** Example

cashier 1	get customer A	subtract	update
	record	\$100 from file	
		balance	

	-----		-----		-----		-----	
t1		t2		t3		t4		t5

cashier 2	get customer A	subtract	update
	record	\$50 from file	
		balance	

New balance = old balance - \$50.

UPDATE CONFLICT CONTROL (CONT'D)

*** Solutions

*** Lockout Mechanisms

*** Restrict Access

*** Avoid Simultaneous Update

*** Timestamping

*** Record Transaction Request Times

*** Ordered Updates

*** Prevent Information Loss

*
* DATA BASE REDEFINITION *
*

DATA BASE REDEFINITION

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Logical Data Structure Redefinition

Physical Storage Structure Redefinition

Language Facilities for Data Base Redefinition

NEED FOR DATA BASE REDEFINITION

- *** System Redefinition
 - *** Add New Function
 - *** Delete Old Function
- *** Performance Improvement
 - *** Save Time
 - *** Increase Size
- *** Changes in Data Semantics
 - *** Add New Relation Between Data Items
 - *** Delete Old Relation Between Data Items

LOGICAL DATA STRUCTURE REDEFINITION

- *** Regrouping of Data Items
- *** Redefining Data Ordering Relationships
- *** Changing Data Validation Criteria
- *** Adding New Relations
- *** Redefining Existing Relations
- *** Deleting Existing Relations

PHYSICAL STORAGE STRUCTURE REDEFINITION

*** Redefining Indexing Policies

*** Adding New Indices

*** Deleting Existing Indices

*** Adding New Data Items

*** Deleting Existing Data Items

LANGUAGE FACILITIES FOR DATA BASE REDEFINITION

*** Need for Data Base Redefinition Languages

*** Extensions to Data Base Definition Languages

*
* ADMINISTRATIVE FUNCTIONS *
*

ADMINISTRATIVE FUNCTIONS

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System Administrator Functions

Data Base Administrator Functions

SYSTEM ADMINISTRATOR FUNCTIONS

- *** Originating the System
 - *** Establishing Initial System Objectives and Requirements
 - *** Planning and Scheduling Phased System Development
 - *** Gross System Design
 - *** Detailed System Design
 - *** Selection and Acquisition of Computer Equipment and System Support Software
 - *** Coding and Implementing the Information System

SYSTEM ADMINISTRATOR FUNCTIONS (CONT'D)

- *** Operating the System
 - *** Generating Files and Data Bases
 - *** System Quality Assurance Testing
 - *** Obtaining Acceptance of System
 - *** Training of System Operations Personnel
 - *** Education of System Users
 - *** Completing Transition from Old System to New System
 - *** System Maintenance
 - *** Future Enhancement
 - *** Periodic System Evaluation

DATA BASE ADMINISTRATOR FUNCTIONS

- *** Detailed Data Base Design
- *** Coding and Implementing the Data Base
- *** Generating Files for Data Base
- *** Data Base Quality Assurance Testing
- *** Obtaining Acceptance of Data Base
- *** Completing Transition from Old Data Base
to New Data Base
- *** Data Base Maintenance
- *** Future Data Base Enhancement
- *** Periodic Data Base Evaluation

*
* DATA BASE SECURITY *
* CONSIDERATIONS *
*

DATA BASE SECURITY CONSIDERATIONS

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Data Base Security Threats

Physical Protection

Authentication

Authorization

Security Logging

Security/Privacy Transformations

DATA BASE SECURITY THREATS

*** Unauthorized Alteration

*** Improper Disclosure

*** Destruction

*** Examples

Wiretapping

Hacking

Sabotaging

Trespassing

PHYSICAL PROTECTION

*** Minimum Protection

*** Fire and Burglar Alarms

*** Locks

*** Tighter Protection

*** Preventing Eavesdropping

*** Background Noise

AUTHENTICATION

- *** Verification of Identity
- *** Software Authentication Technologies
 - *** Password
 - *** Questions and Answers
 - *** Lock and Key
 - *** Generated by Complex Algorithms
or Chosen by User
 - *** Restricts Incorrect Login Attempts
 - *** Notify User
 - *** Notify Administrator
 - *** Safeguarding Password
 - *** Reauthenticate User's
Identification
 - *** Scheduled Activity
 - *** Extraordinary Occasion
- *** Cryptography
- *** Dial Back Technique

AUTHENTICATION (CONT'D)

*** Physical Authentication Technologies

*** Signature

*** Machine Readable I.D. Cards

*** Fingerprints

*** Voiceprints

AUTHORIZATION

*** Verification of Access Rights

*** Methods For Authorization

*** Password

*** Cryptography

*** Access Control List

*** Procedure-Based Access Control

AUTHORIZATION (CONT'D)

*** Access Control

*** User Identification and Activity
Controlled by Data Base Administrator

*** Requires an Arbiter Program

*** Access Problems

*** Impediment to Legitimate Users

*** Increased Overhead

*** Increased Response Time

SECURITY LOGGING

*** Security Logging Process

- *** Collect Information

- *** Maintain History

- *** Support Analysis

*** Threat Monitoring

- *** Detected Data Security Threats

- *** Reaction to Threats

- *** Real-time Threat Monitoring

- *** Non-real-time Threat Monitoring

SECURITY / PRIVACY TRANSFORMATIONS

*** Data Encoding

*** Conceals Information

*** Encryption/Decryption Key

*** Methods of Security Transformations

*** Substitution Ciphers

*** Transposition Ciphers

*** Product Ciphers

*** Exponentiation Ciphers

SECURITY / PRIVACY TRANSFORMATIONS (CONT'D)

*** Examples of Substitution Cipher

*** C -> R, O -> E, M -> D, P -> V, U -> C,
T -> I, E -> B, R -> X, ...

*** COMPUTER ----> REDVCIBX

*** S -> M, E -> A, C -> T, U -> R, R -> I,
I -> C, T -> E, Y -> S, ...

*** ----> MATRICES

SECURITY / PRIVACY TRANSFORMATIONS (CONT'D)

*** Example of Transposition Cipher

*** A: 00, B: 01, ... , Z: 25

*** Key: RCA

*** SCIENCE ---> 18 02 08 04 14 02 04

*** RCARCAR ---> 17 02 00 17 02 00 17

*** Add above ---> 09 04 08 21 16 02 21

*** Ciphertext ---> J E I V Q C V

*** Note that the add operation was mod 26

*
* PERFORMANCE MEASUREMENT *
* AND *
* EVALUATION *
*

PERFORMANCE MEASUREMENT AND EVALUATION

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User Interface/Interaction Orientations

System Execution Efficiency Orientations

Tools and Techniques

*
* USER INTERFACE/ INTERACTION *
* ORIENTATIONS *
*

PERFORMANCE MEASUREMENT AND EVALUATION

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User Interface/Interaction Orientations

System Execution Efficiency Orientations

Tools and Techniques

*
* USER INTERFACE/ INTERACTION *
* ORIENTATIONS *
*

USER INTERFACE / INTERACTION ORIENTATIONS

*** Support for User-Oriented Analysis

*** Costs

*** Performance

*** Benefits

*** Measurement Parameters

*** Response Time

*** Convenience of Access

*** Command Language

*** Format of Output

*** Volume of Output

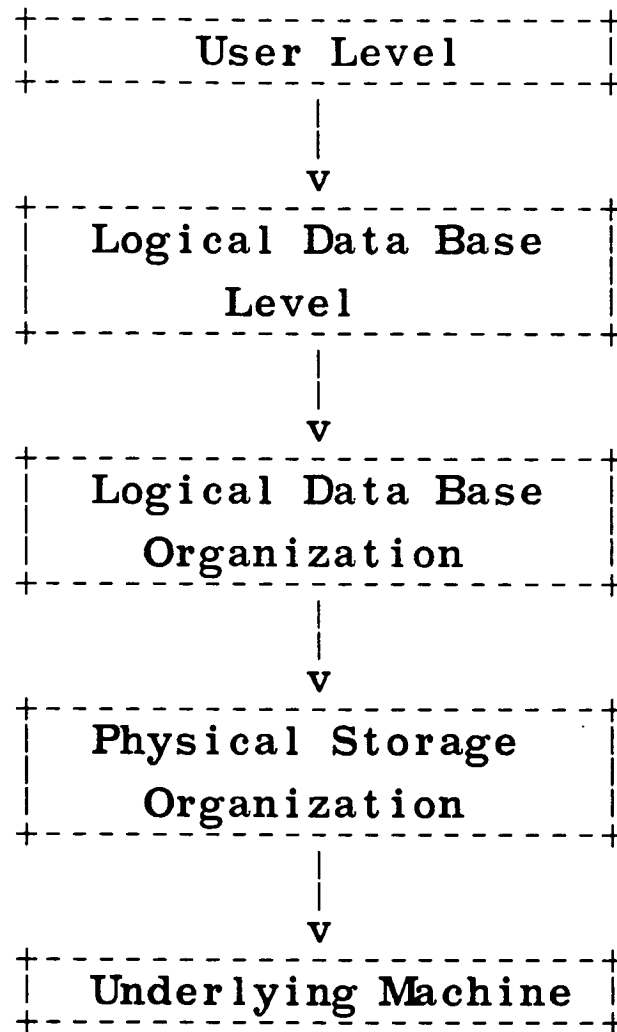
*** User Effort

*** User Expectations

*** Overall Satisfaction

*
* SYSTEM EXECUTION EFFICIENCY *
*
* ORIENTATION *
*

SYSTEM EXECUTION EFFICIENCY ORIENTATION



Hierarchical IS&R Evaluation Model

SYSTEM EXECUTION EFFICIENCY ORIENTATION

*** Sample Measurement Parameters

*** User Level

- *** Maximum Number of Retrievals Desired

- *** Number of Searches Conducted per Session

*** Logical Data Base Design Level

- *** Number of Relations

- *** Number of Record Types

*** Logical Data Base Organization Level

- *** Record Counts for Data and Index Files

- *** Logical I/O Cost for Each Access Path

*** Physical Storage Organization Level

- *** Total Storage Requirements

- *** Physical I/O Costs

*** Underlying Machine Level

- *** CPU Instruction Rate

- *** Main Memory Size

*
* TOOLS AND TECHNIQUES *
*

TOOLS AND TECHNIQUES

*** Monitors

*** Software Monitors

*** Hardware Monitors

*** Models

*** Analytical Model

*** SiMulation Model

*** Queueing Model

*** Benchmarks and Synthetic Programs

*** Subjective Measures

*** User Questionnaires

*** Evaluation Forms

TOOLS AND TECHNIQUES (CONT'D)

*** Monitors

*** Data Collection Method

*** Software Monitors

*** Computer Programs

*** Inserted in System

*** Record Events of Interest

*** Examples

Duration of Search

Number of Queries

Number of Errors

*** Hardware Monitors

*** Electronic Devices

*** Embedded in Computer

*** Extract Performance Data

*** Examples

Number of Page Faults

Number of Files Accessed

TOOLS AND TECHNIQUES (CONT'D)

*** Models

*** Analytic Models

- *** Mathematical Representation
- *** Various Levels of Complexity
- *** Used for Specific System Components
- *** Good for Supplementing Major Evaluations

*** Queueing Models

- *** Subset of Analytic Models
- *** Examines Resource Contention
 - *** System Loads
 - *** System Resources
 - *** Gauges Effects of Changes

*** Simulation Models

- *** Imitation of System
- *** Most Powerful Technique
- *** Most Flexible Technique
- *** High Development Cost
- *** Difficult to Validate

TOOLS AND TECHNIQUES (CONT'D)

*** Benchmarks

- *** Mix of Existing Programs

- *** Actual Running Jobs

- *** Measure Different Aspects of Performance

- *** Portable

- *** Tightly Controlled

- *** Provide Standard of Comparison

- *** Different Systems

- *** Different States of One System

*** Synthetic Programs

- *** Structured Sequence of Commands

- *** Measure Specific System Activities

- *** Coded Like a Program

- *** Not an Actual Job

- *** Emulate Projected Workload

TOOLS AND TECHNIQUES (CONT'D)

*** Subjective Measures

*** User Questionnaires

*** Evaluation Forms

*** Sample Parameters

*** User Classes

*** Frequency of Use

*** Mode of Operation

*** Systems Experience

*** System Characteristics

*** Online Help

*** User Control

*** Ease of Learning

*** Flexibility in Task Handling

*** Fault Tolerance

*** Correspondence with Expectations

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BIBLIOGRAPHIC
DATA BASE DESIGN

**BIBLIOGRAPHIC
DATA BASE DESIGN**

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Bibliographic Data Base Organization

Document File Design Considerations

Types of Files

*
*
*
*
*
*
*
*

BIBLIOGRAPHIC
DATA BASE ORGANIZATION

BIBLIOGRAPHIC DATA BASE ORGANIZATION

*** Item or Field

*** Smallest Unit

*** Specific Data

*** Examples

Title

Abstract

Journal Name

Volume Number

*** Group

*** Collection of Items

*** Structured by Relationship

*** Example

Publisher Address

Consists of

Post Office Box Number

City

State

Zip Code

BIBLIOGRAPHIC DATA BASE ORGANIZATION (CONT'D)

*** Record

- *** Collection of Items
- *** Represents One Document
- *** Examples
 - Book Record
 - Article Record

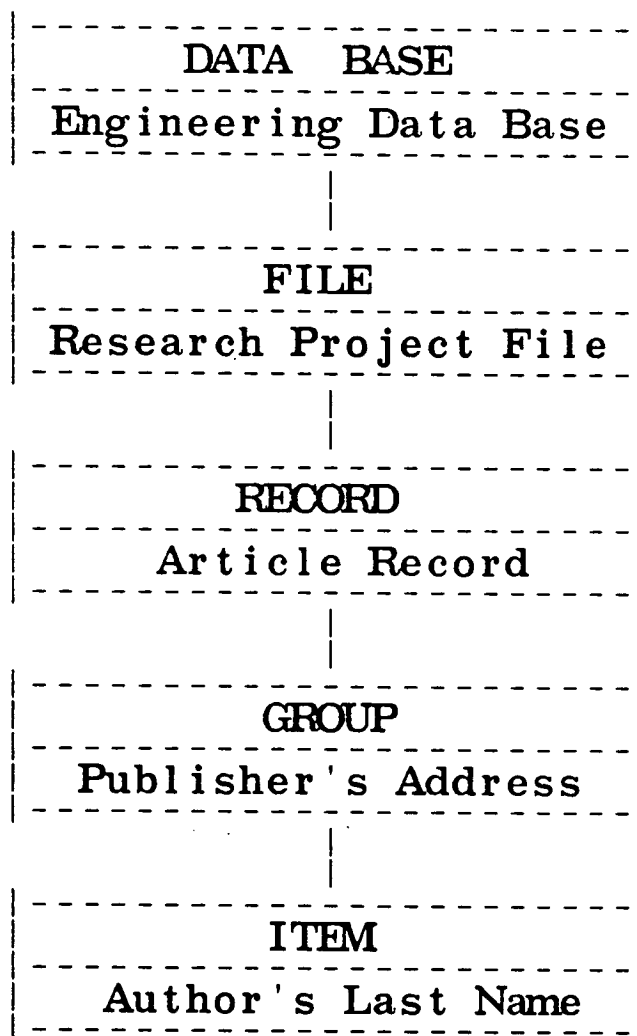
*** File

- *** Collection of Record Occurrences
- *** Usually Related Documents
- *** Examples
 - Research Project File
 - Book File
 - Foreign Language Book File

*** Data Base

- *** Collection of Files
- *** Relationship Optional
- *** Examples
 - Chemical Data Base
 - Educational Data Base

BIBLIOGRAPHIC DATA BASE ORGANIZATION (CONT'D)



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DOCUMENT FILE
DESIGN CONSIDERATIONS

DOCUMENT FILE DESIGN CONSIDERATIONS

*** Bibliographic Data Types

*** Alphabetic

*** Example: Author Name

*** Alphanumeric

*** Example: Title

*** Integer

*** Example: Volume Number

*** Real

*** Example: Index Number

*** Character

*** Example: Abstract of Document

*** Boolean

*** Example: True or False

DOCUMENT FILE DESIGN CONSIDERATIONS (CONT'D)

*** Record Design

*** Define Index or Key Items

*** Relationships Between Data Items

*** Length of record

*** Fixed

*** Variable

*** Choose Record Format

DOCUMENT FILE DESIGN CONSIDERATIONS (CONT'D)

*** Data Usage and Updating

*** User Query Requirements

*** Frequency of Data Usage

*** Frequency of Data Updating

*** Change

*** Insert

*** Delete

*** File Structure

*** Types and Amount of Data Stored

*** Types and Amount of Data Retrieved

*** Available Physical File Organizations

*** Performance Estimate

*** Cost / Benefit Evaluation

*
*
* TYPES OF FILES *
*
*

TYPES OF FILES

*** Document Files

- *** Contain the Physical Document Information

- *** Very Large Files

- *** Primarily Textual Data

- *** Stored by Character Code

 - *** Examples

 - ASCII

 - EBEDIC

 - *** Fixed or Variable Length Fields

*** Index Files

- *** Contain Indices

- *** Support Data Access

- *** Examples of Indices

 - Title

 - Subject Term

 - Library of Congress Number

TYPES OF FILES (CONT'D)

*** Thesaurus Files

*** Collection of Thesaurus Terms

*** Narrower Term

*** Example

COMPUTER -----> MICROCOMPUTER

*** Broader Term

*** Example

MICROCOMPUTER -----> COMPUTER

*** Related Term

*** Example

COMPUTER -----> MICROCHIP

*** Synonymous Term

*** Example

ROBOT -----> WORKING MACHINE

TYPES OF FILES (CONT'D)

*** Sample Search File

*** Collection of Typical Searches

*** Introduction for New Users

*** Guidance for Improvement of Search Skills

*** HOOK UP TO SYSTEM EXAMPLE ***

TYPES OF FILES (CONT'D)

*** User Profile File

*** User Interests Description

*** User Specified Terms

*** Logical Combinations

*** Used for Selective Dissemination of Information (SDI)

*** Periodically Performed

*** Extracts New Material

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

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BIBLIOGRAPHIC
FILE STRUCTURE

BIBLIOGRAPHIC FILE STRUCTURE

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Linear File Organization

Indexed File Organization

List Structured File Organization

Tree and Network File Organization

Clustered File Organization

*
*
*
*
*
*
*
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*

LINEAR FILE
ORGANIZATION

LINEAR FILE ORGANIZATION

* * * Unordered Sequential File

* * * Unordered Collection of Records

* * * Simplest File Structure

* * * Serial Search Required

* * * Easy Data Insertion

* * * Good for a Small Data File

LINEAR FILE ORGANIZATION (CONT'D)

*** Ordered Sequential File

*** Sequentially Sorted

*** By Key Field of Each Record

*** Binary or Block Search Possible

*** File Rearrangement Required for Data
Insertion

LINEAR FILE ORGANIZATION (CONT'D)

*** Tradeoffs

*** Advantage

*** Minimum File Maintenance Process
Required

*** Easy Data Insertion

*** Easy Data Deletion

*** Disadvantage

*** Inefficient Information Retrieval

*
*
* INDEXED FILE *
* ORGANIZATION *
*

INDEXED FILE ORGANIZATION

*** Indexed Sequential File

*** One or More Indices

*** Provide File Access

*** Degree of Indexing

*** Full Indexing

*** All Key Values in Index

*** Partial Indexing

*** Subset of Key Values in Index

INDEXED FILE ORGANIZATION

*** Indexed Non-sequential File

*** One or More Indices

*** Provide File Access

*** Requires Full Indexing

*** Also Called Random Accessing
Organization

INDEXED FILE ORGANIZATION (CONT'D)

*** Tradeoffs

*** Advantages

*** Ensures Quick Access

*** Efficient Storage

*** Disadvantage

*** Indices Must Be Stored and Updated
When Change Occurs

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LIST STRUCTURED
FILE ORGANIZATION

LIST STRUCTURED FILE ORGANIZATION

*** Singly Linked List

*** One Link Per List Entry

*** Uni-directional

*** Physically Separate Entries

LIST STRUCTURED FILE ORGANIZATION (CONT'D)

*** Doubly Linked List

*** Two Links Per List Entry

*** Forward and

*** Backward

*** Circularly Linked List

*** Singly Linked List or

*** Doubly Linked List

*** Last Element Linked to First Element

LIST STRUCTURED FILE ORGANIZATION (CONT'D)

*** Inverted File

- *** Lists of Pointers
- *** Used for Indices
- *** Physically Separate from Data
- *** Most Common Implementation
- *** Fast Access
- *** Efficient Storage

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*      TREE      AND      NETWORK
*
*      FILE      ORGANIZATION
*
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TREE AND NETWORK FILE ORGANIZATION

*** Tree Structured File Organization

*** Basic Terms

*** Parent / Child

*** Directed Link

*** FROM Parent

*** TO Child

*** Root Node

*** No Parent

*** Leaf Node

*** No Child

*** Level Number

*** Number of Steps from Root to Node

*** Degree

*** Number of Children of a Node

TREE AND NETWORK FILE ORGANIZATION (CONT'D)

*** Binary Tree

*** Node Degree

*** Two (2)

*** One (1)

*** Zero (0)

TREE AND NETWORK FILE ORGANIZATION (CONT'D)

*** Balanced Tree

*** All Leaves on Last 2 Levels

*** Higher Levels

*** Equal Node Degree

TREE AND NETWORK FILE ORGANIZATION (CONT'D)

*** Simple Network and Complex Network

*** Simple Network

*** Mappings

*** One-to-One

*** One-to-Many

*** Many-to-One

*** Complex Network

*** Mappings

*** Include Many-to-Many

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CLUSTERED FILE
ORGANIZATION

CLUSTERED FILE ORGANIZATION

*** Cluster

*** Collection of Records

*** Common Concept

*** Logically Partitioned

*** May Be Physically Adjacent

*** Facilitates

*** Faster Searching

*** Faster Retrieval

CLUSTERED FILE ORGANIZATION (CONT'D)

*** Cluster Generation

*** Classification Methods

*** Common Term Classes

*** Similarity of Keywords

*** Statistically Related Documents

*** Cluster Membership

*** Not Limited to One Cluster

*** Overlap Possible

CLUSTERED FILE ORGANIZATION (CONT'D)

*** Cluster Search

*** Inverted File Search

*** Match Search Request Against All
Clusters

*** Retrieve Proper Cluster

*** Match Request Against Individual
Documents

*** Retrieve Specific Document

*** Automatic Retrieval of Related
Documents

CLUSTERED FILE ORGANIZATION (CONT'D)

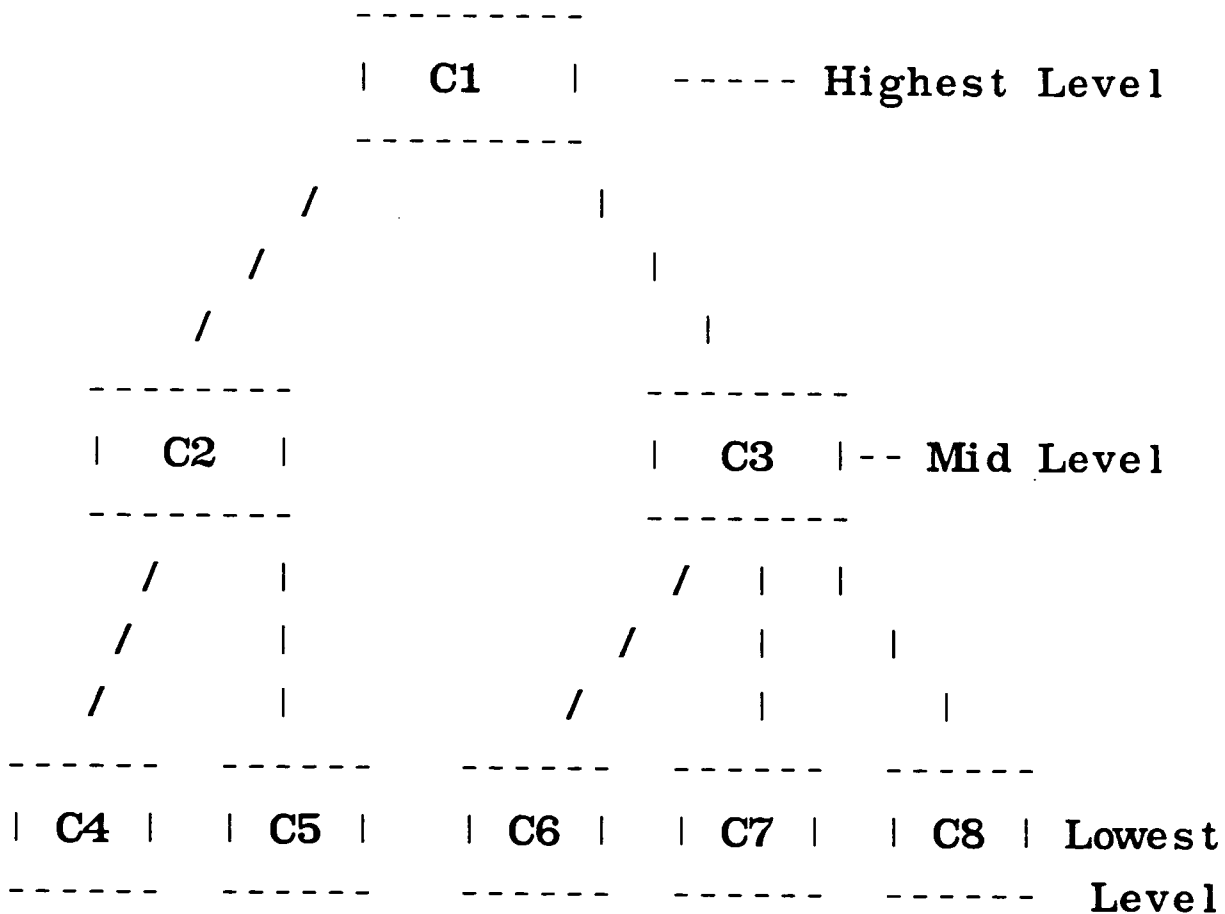
*** Cluster Search (cont'd)

*** Cluster Hierarchy

*** Groups of Clusters

*** Broader Coverage

*** Many Possible Levels



CLUSTERED FILE ORGANIZATION (CONT'D)

*** Cluster Search (cont'd)

*** Top-Down Strategy

Highest Level
to
Lower Levels

*** Bottom-Up Strategy

Lowest Level
to
Higher Level

CLUSTERED FILE ORGANIZATION (CONT'D)

*** Tradeoffs

*** Advantages

*** Easy Basic Concept

*** Efficient Information Retrieval

*** Disadvantages

*** Complexity of Cluster Generation

*** Excessive Storage

*** Continuous Restructuring As Updates Occur

VOCABULARY
CONTROL

VOCABULARY CONTROL

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Controlled Vocabularies

Free Text Approaches

Thesaurus Support

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*
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CONTROLLED
VOCABULARIES

CONTROLLED VOCABULARIES

- *** List of Index-Search Terms
 - *** Consistent Indexing
 - *** Search-Index Correspondence
- *** Compound Concepts
 - *** Pre-Coordination
 - *** Post-Coordination

CONTROLLED VOCABULARIES

- *** List of Index-Search Terms
 - *** Predefined List
 - *** Postable Terms
 - *** Document Class for Each Term
 - *** Related Documents
 - *** Small Vocabulary
 - *** Advantage
 - *** Recall
 - *** Easier to Find Documents
 - *** Disadvantage
 - *** Retrieves Irrelevant Documents
 - *** Large Vocabulary
 - *** Advantage
 - *** Few Irrelevant Documents
 - *** Good Precision
 - *** Disadvantage
 - *** Fails to Find Some Documents

CONTROLLED VOCABULARIES (CONT'D)

Example

Find BROWN BREAD

Language A

Language B

Language C

Food

Food

Food

Grain Products

Grain Products

Bread

Bread

Form

Loaves

Rolls

Ingredient

Brown Bread

White Bread

[J. Aitchison and A. Gilchrist, Thesaurus Construction, A Practical Manual, Aslib, London, 1972.]

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

CONTROLLED VOCABULARIES (CONT'D)

*** Controlled Vocabulary Provides

*** Consistent Indexing

*** Indexers Limited to Listed Terms

*** More Likely to Choose Same Terms

Indexer: "It's about the Civil War, the thesaurus says to use WAR BETWEEN THE STATES."

*** Indexing Steps

*** Analyze Concept of Document

*** Assign Index Terms

CONTROLLED VOCABULARIES (CONT'D)

*** Search-Index Correspondence

*** Searchers Limited to Listed Terms

*** More Likely to Choose Correct Terms

Customer: "I need a book about the Civil War."

Librarian: "Look under WAR BETWEEN THE STATES."

Customer: "I found it, thanks."

*** Searching Steps

*** Analyze Concept of Request

*** Assign Search Terms

CONTROLLED VOCABULARIES (CONT'D)

*** Compound Concepts

*** Pre-Coordination

*** Many Multi-word Terms

*** Large Vocabulary

*** Better Precision

*** Used for Indexing

*** Frequently Encountered
Concepts

*** Complex Specific Concepts

*** Examples

Aircraft engines

Central heating

CONTROLLED VOCABULARIES (CONT'D)

*** Compound Concepts (cont'd)

*** Post-Coordination

*** Single Terms

*** Smaller Vocabulary

*** Better Recall

*** Grouping Techniques

*** Linguistic

*** Example

Aircraft engines, use

Aircraft and Engines

*** Semantic

*** Example

Cardiac failure

use Heart

Output

Below

Normal

[Ibid]

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FREE TEXT
APPROACHES

FREE TEXT APPROACHES

- *** No Index-Search List
 - *** Indexers May Choose Different Classes
 - *** Searchers Have No Guidance
 - *** Reduced Recall
 - *** Reduction of Relevant Material Retrieved
 - *** Uncertain Precision
 - *** Questionable Relevance of Retrieved Material
 - *** Limits Generic Searching
 - *** Restricts Browsing

FREE TEXT APPROACHES (CONT'D)

- *** Terms Taken Directly From Text
 - *** Advantage
 - *** No Distortion of Author's Words
 - *** Disadvantages
 - *** Uncontrolled Vocabulary Size
 - *** Greater Search Effort
 - *** Tools Required to Rectify
 - *** Idiosyncrasies
 - *** Imprecision
 - *** Misspellings, etc.

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THESAURUS
SUPPORT

THESAURUS SUPPORT

*** Basic Concepts of Thesauri

*** Roget Type

*** List of Synonyms

*** Choice of Alternative Words

*** Example

injury, n. harm, sprain, damage, mutilation, blemish, cut, gash, scratch, stab, bite, fracture, hemorrhage, sting, bruise, sore, cramp, trauma, abrasion, burn, swelling, wound, scar, laceration, affliction; see also pain.

[C. Laird, Webster's New World Thesaurus, Popular Library, New York, NY, 1974.]

THESAURUS SUPPORT (CONT'D)

- *** Basic Concepts of Thesauri (cont'd)
 - *** Information Storage and Retrieval Systems
 - *** List of Descriptors - Subject Headings
 - *** Directs to Postable Terms
 - *** Implementations
 - *** Bound
 - *** Online

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

THESAURUS SUPPORT (CONT'D)

- *** Thesaurus Utilization
 - *** Synonyms and Near Synonyms
 - *** Misspellings
 - *** Abbreviations
 - *** Homographs
 - *** Search Enlargement
 - *** Search Restriction

THESAURUS SUPPORT (CONT'D)

*** Synonyms

*** Examples

Zinc Coatings

UF Galvanizing

Galvanizing

USE Zinc Coatings

*** Near Synonyms

*** Semantic Overlap

*** Example

Lighting

USE Illumination

*** Viewpoints

*** Example

Smoothness

UF Roughness

THESAURUS SUPPORT (CONT'D)

- *** Misspellings - Alternative Spellings
 - *** Treated As Synonyms
 - *** Can be Difficult to Identify
 - *** Incorporated in Online Thesaurus
 - *** Entry Vocabulary

- *** Examples

Bound

Caesium

USE Cesium

Online

Ateliosis

Atheist

----> Athelete

Athematic

Atherine

Atherosclerosis

Athlete

Athrocyte

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

THESAURUS SUPPORT (CONT'D)

*** Abbreviations

*** Listed as Synonyms

*** Examples

Au

USE Gold

LA

USE Louisiana

THESAURUS SUPPORT (CONT'D)

*** Homographs

*** Look Alike

*** Sound Alike

*** Different Meanings

*** Denoted by:

*** Scope Notes

*** Example

Mercury (Metal)

Mercury (Planet)

*** Alternative Endings

*** Example

Concentration

Concentrating

*** Modifiers

*** Example

Air cleaner

Vacuum cleaner

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

THESAURUS SUPPORT (CONT'D)

*** Search Enlargement

*** Broader Terms

*** Example

Bread

BT Grain Products

*** Related Terms

*** Example

Gambia

RT Africa

THESAURUS SUPPORT (CONT'D)

*** Search Confinement

*** Narrower Terms

*** Example
Medicine
NT Pediatrics

*** Related Terms

*** Example
Sediment
RT Strata

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

THESAURUS SUPPORT (CONT'D)

*** Using the Bound Thesaurus

*** Select Terms to Help Design Search

*** Saves Time

*** Saves Money

*** Saves Frustration

*** Algorithm

*** For Each Concept Involved

*** Refer to Access Vocabulary

*** Refer to Thesaurus

*** Search on Broader Terms

*** Search on Narrower Terms

*** Search on Related Terms

*** Determine Boolean Combinations

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

THESAURUS SUPPORT (CONT'D)

*** Using the Online Thesaurus

*** Shows Postable Terms

*** Saves Time

*** Saves Money

*** Saves Frustration

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

*
* BIBLIOGRAPHIC DATA BASE SEARCHING *
*

TYPES / LEVELS OF SEARCH LANGUAGES

TYPES/LEVELS OF SEARCH LANGUAGES

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Overview of Bibliographic Data Base Searching

Search Languages

Integrated Combinations of Search Languages

*
* OVERVIEW OF BIBLIOGRAPHIC DATA BASE SEARCHING *
*

OVERVIEW OF BIBLIOGRAPHIC DATA BASE SEARCHING

*** User Needs

*** Retrieve Facts or Information

*** Convenient Communication with the System

*** Quick Response Time

OVERVIEW OF BIBLIOGRAPHIC DATA BASE SEARCHING (CONT'D)

*** Language Capabilities

*** WHAT Information Is Desired

*** HOW Information Is Retrieved

*** Boolean Operations

Examples: AND, OR, NOT

*** Relational Operations

Examples: EQ, NE, GT, LT, GE, LE

*** Help Functions

*** Error Detection / Correction

*** Existence of Information in Data Base

*** Count of Occurrences of Information in Data Base

*** Report Generation Capabilities

OVERVIEW OF BIBLIOGRAPHIC DATA BASE SEARCHING (CONT'D)

*** Concepts

*** Different User Categories

Require Different Language Features

*** Correlation Between Levels

*** One Root Language For

Hierarchy of Search Languages

*
* SEARCH LANGUAGES *
*

SEARCH LANGUAGES

*** Procedural Languages

*** Must Specify

*** What is Wanted

*** How to Obtain it

*** Implementations

*** Batch Languages

*** Embedded Language

*** Stand-Alone Languages

*** System may Support

*** Multiple Host Languages

*** Multiple Search Languages

*** Characteristics

*** User is Skilled Programmer

*** Batch or Online Mode

SEARCH LANGUAGES (CONT'D)

*** Language Style

*** Sequential Instructions

*** Syntax Compatible with
Host Language

*** Mixed with Host language or
Subroutines to Host Language

SEARCH LANGUAGES (CONT'D)

- *** Non-Procedural Languages
 - *** High-Level Command Language
 - *** Designed for Non-Programming Users
 - *** Complete Language
 - *** Obtains Data
 - *** Manipulates Data
 - *** Independent of Data Structures
 - *** Language Dependent Builtin Functions
 - *** Help Facilities
 - *** Implementations
 - *** Menu-Oriented Languages
 - *** Prompt-Oriented Languages

SEARCH LANGUAGES (CONT'D)

*** Prompt-Oriented Languages

*** User Friendly

*** User Prompted

*** Examples

Granting Access

Please Input Your Name?

(User) EavesTM

Please Input Your
Password

(User)

Bulletin Requests

Do you Want to See

Bulletin dated (04/15/84)

(User) Yes/NO

SEARCH LANGUAGES (CONT'D)

*** Help

*** Displays System Commands

*** User Chooses Desired Command

*** Separate Commands for

*** Search

*** Reporting

*** Search Commands

*** Free Text Query

*** Example

Please enter System Command

(User) "Data Base Management"

63 items

*** Selective Field Search

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

SEARCH LANGUAGES (CONT'D)

*** Language Construct

*** Conditions

*** Relational Conditions

*** On Data Base Fields

*** On Text Strings

*** On Numeric Values

*** Boolean Conditions

*** On Relational Conditions

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

*** Reporting

*** Default Reports

*** Formatted Reports

SEARCH LANGUAGES (CONT'D)

*** Example of Language Construct in MADAM
(Multics Approach to Data Access and
Management, University of Southwestern
Louisiana, Lafayette, Louisiana)

Please enter Next Term or System
Command?

(User) Select

Please input Valid Selection
Criteria?

(User) Title

Please input the Query for Title?

(User) eq "Data Base"

Please input the rest of the
Query, use a semicolon to terminate
the Query?

(User) author eq "Date";

2 items

Please enter Next Command or
System Command?

SEARCH LANGUAGES (CONT'D)

- *** Offline Query Language
 - *** Formatted Forms Used
 - *** Request Filled in Form
 - *** Special Forms for Each Request Type
 - *** User Supplied with Forms
 - *** User Steps in Filling Form
 - *** Refers Data Dictionary
 - *** Finds Data Base Field Names
 - *** Fills the Form
 - *** Submits to Data Processing Organization
 - *** Data Processing Organization
 - *** User Form Key Punched
 - *** Processed
 - *** Result Report Delivered

SEARCH LANGUAGES (CONT'D)

- *** Online Query Language
 - *** Designed for Display Terminal
 - *** Tabular Syntax
 - *** Tables Constructed
 - *** Partly by User
 - *** Partly by System
 - *** Sequence of Filling Immaterial
 - *** Steps in Filling Table
 - *** User : Presses a terminal
function Key
 - *** System : Displays Skeleton
Table
 - *** User : Table first column
filled with file
name
 - *** System : Column names of
file filled in Table
 - *** User : Search data filled in
Columns

SEARCH LANGUAGES (CONT'D)

*** Same Table Used for

*** Retrieval

*** Reporting

*** Selection Conditions

*** Relational Conditions

*** Help

*** On Request All File Names

*** All Columns of Desired File

*** Reports

*** Table Form with Column Headings

*** Ascending / Descending Sorting

*** Support for Builtin Functions

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

SEARCH LANGUAGES (CONT'D)

*** Computer-Initiated Language

*** Question Modes

*** Simple Yes-No Mode

*** Multiple-Choice Mode

*** Entries Are Commonly Known Identifying
Terms / Names of Objects

*** Tree Structured Information Retrieval

*** Designed Primarily for End Users

SEARCH LANGUAGES (CONT'D)

* * * Menu-Oriented Languages

* * * Example

The type of citations to be searched is:

Enter the Line Number --

1. Articles in Journals
2. Books
3. Both of Above
4. None of Above

> > > 1

SEARCH LANGUAGES (CONT'D)

The access key to be selected is:

Enter the Line Number--

1. Title
2. Author
3. Abstract
4. Keywords
5. Date
6. None of these, display next screen

>>> 1

SEARCH LANGUAGES (CONT'D)

The first character of the author's last name is:

Enter the Line Number--

1. A B

2. C D

3. E F I

4. H I J K

5. L M N

6. None of these, display next screen

>>> 2

SEARCH LANGUAGES (CONT'D)

The author's name is:

Enter the Line Number--

1. Can, E. M.
2. Christian, R. W.
3. Codd, E. F.
4. Croft, M. F.
5. Date, E. A.
6. None of these display next screen

>>> 5

SEARCH LANGUAGES (CONT'D)

Is further indexing required?

Enter the Line Number--

1. Yes

2. No

> > > 1

SEARCH LANGUAGES (CONT'D)

The Number of Desired Records is:

5

Do you want to see the list of records:

Enter Line Number:

1. Yes, on the screen
2. Yes, print the list
3. Yes, both of above
4. No

>>> 3

SEARCH LANGUAGES (CONT'D)

Indicate preferred output format:

Enter Line Numbers in order--

- | | |
|----------------|---------------------|
| 1. Title | 7. Volume Number |
| 2. Author | 8. Issue Number |
| 3. Affiliation | 9. Abstract |
| 4. Journal | 10. Reference Code |
| 5. Date | 11. Category Number |
| 6. Page Number | |

>>> 1 2 4 5 6 7

SEARCH LANGUAGES (CONT'D)

*** Restricted Natural Languages

*** Natural Language Input with
Syntactic Restrictions

*** Use Keywords and Boolean Logic
Operations

*** Designed for End Users

SEARCH LANGUAGES (CONT'D)

* * * Example

Syntax: select <target expression>
 where <qualification>

select articles where author is 'DATE'
 and title contains
'DATABASE' .

The number of records is : 5

SEARCH LANGUAGES (CONT'D)

*** Unrestricted Natural Languages

*** Syntax Free Natural Language Input

*** Two-Step Translation Process

*** Requires Longer Response Time

*** Designed for End Users

SEARCH LANGUAGES (CONT'D)

*** Example

user: please give me the number of articles
whose title contains 'database' and is
written by Date.

system: Do you want to know the number of
articles for which the author is "DATE"
and whose title contains 'database'? If
yes, please press 'return' key;
otherwise, specify your specify you
request again.

user : <return>

system: There are 5 articles written by Date and
whose title contains 'database.' Do you
want to see the list of the articles? If
yes, please answer yes, otherwise, please
press 'return' key.

User: yes

SEARCH LANGUAGES (CONT'D)

system: Do you want the output printed on the screen or on a printout, please select one of the following numbers:

1. on the screen
2. on a print

user: 1

system: The following is a list of items found in an article record, what items would you like to print?

Please select the item number(s) you prefer and enter them in order: 1. title
2. author

:

:

11. categories

user: 1 2 3 5

SEARCH LANGUAGES (CONT'D)

system: The articles are :

:
:
:

< information >

:
:

Do you want to get a print ?

If no, please press 'return' key;
else,

please answer 'yes'.

user: < return >

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SEARCH
FORMULATION
FEATURES

SEARCH FIELD CONTROL

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SEARCH FIELD CONTROL

- *** Text Fields
 - *** Title
 - *** Series Title
 - *** Abstract
 - *** Subject Heading
 - *** Publisher
 - *** Conference
 - *** Name
 - *** Place
 - *** MeSH Subjects
 - *** Medical Subject Headings

SEARCH FIELD CONTROL (CONT'D)

- *** Non-Text
 - *** Date
 - *** Author
 - *** Language
 - *** Issue Number
 - *** Report Number
 - *** Contract Number
 - *** Subject Terms
 - *** Major Terms
 - *** Minor Terms
- *** Library Holding Data
 - *** Accession Number
 - *** Dewey Number
 - *** Library of Congress Number
 - *** Library Location

SEARCH FIELD CONTROL (CONT'D)

*** Variations

*** Serials

*** Books

*** Specific File Collections

*** Specific Systems

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

SINGLE TERM SEARCHING

*** Single Term Searching

*** Collective Fields

*** Text

*** Non-Text

*** Individual Fields

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

SINGLE TERM SEARCHING (CONT'D)

*** Stopwords

- *** Too Frequent Occurrences
- *** Ignored for Indexing and Searching
- *** Length and Composition Varied
According to System

*** Examples:

the

an

to

for

Letters of the alphabet

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

PHRASE SEARCHING

*** Individual Fields Only

*** Direct Entry

*** Compound Term in Natural Order

*** More Like Natural Speech

*** Example:

Spring Operated Locks

*** Indirect Entry

*** Compound Term in Inverted Form

*** Class Grouped in One Place

*** Example:

Locks, Spring Operated

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

TERM PROMIXITY SEARCHING

*** Position Checking:

*** Using "Infix" (adj, (w))

*** Examples:

SPACE adj SHUTTLE (ORBIT)

SPACE (w) SHUTTLE (DIALOG)

SE (5OR SPACE SHUTTLE+6*FLIGHT)

*** Order of terms:

BEFORE <proximity> JANUARY

*** Respect Order

BEFORE JANUARY

*** Any Order

BEFORE JANUARY

JANUARY BEFORE

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

TERM PROXIMITY SEARCHING (CONT'D)

*** Word Position in Some Inverted Files
 <ACCESS NUMBER> (position)

SPACE ("n"w) SHUTTLE

is equivalent to:

1/ SELECT SPACE AND SHUTTLE

2/ if SHUTTLE(position)

 - SPACE (position) = "n"

 then Posting = Posting + 1;

*** Stop Words are Usually Included
 In Assigning Position

*** No Word Position: Search a String
 SPACE SHUTTLE

TERM PROXIMITY SEARCHING (CONT'D)

*** Relative Position

* * * If Word Position is Very Detailed

〈ACCESS NUMBER〉 〈field, phrase, paragraph〉

User Can Locate Data Within Specific Fields

* * * Within a Field

SELECT COMPUTER (f) ARCHITECTURE

* * * Within a Phrase

*** * * Within a Paragraph**

* * * Within a Record

SELECT NUCLEAR (c) ENGINEERING

is equivalent to:

SELECT NUCLEAR AND ENGINEERING

or

SELECT NUCLEAR; SELECT ENGINEERING;
COMBINE 1 AND 2

TERM RANGE SEARCHING

*** Limiting Search

*** Reduce the Size of a Set

*** Boolean "AND" and "NOT"

*** Other Ways System-Dependent

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

TERM RANGE SEARCHING

- *** Limits on a Numeric Field
GREATER THAN, LESS THAN, FROM <...> TO
 - *** Range of Sets
SEARCH "R1-R10" * (SPACE SHUTTLE)
 - *** Range of Dates
(ENGINEERING OR PHYSICS)
AND YEAR GREATER THAN 1983
- *** Limit Commands
 - *** Allow Restrictions
on a Broad Search
 - *** Date
 - *** Type of Publications
 - *** Language
COMBINE URANIUM AND LA/FRENCH
 - *** Country of Origin
- *** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

TERM RANGE SEARCHING (CONT'D)

*** Update Fields

*** Exists in Most Records

*** Frequency of Updates Varies

*** Allows SDI

*** Convenient Limitations of Search

ROOT SEARCHING

- *** Select the Stem of Each Term
 - *** Easy Algorithm
 - *** Many Possible Algorithms
 - *** Check Validity of Stems
 - *** Reduce Index Size
 - *** Retrieve More Potentially Relevant Items
 - *** Beware of Large Posting
 - *** Slow
 - *** Expensive Search
 - *** Usually Limited by System
 - *** Keep Extensive Search as Last Resort

ROOT SEARCHING (CONT'D)

*** Suffix Strip

PUBLISH

PUBLISH(ed)

i.e: PUBLISH(*): PUBLISH(er)

PUBLISH(es)

PUBLISH(ing)

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

*** List of Suffix

*** Verbs, Adverbs, Plural

ROOT SEARCHING (CONT'D)

*** Prefix Strip

(chemo)THERAPY
i.e: (*)THERAPY: (electro)THERAPY
(psycho)THERAPY

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

*** List of Prefixes

*** Less Frequently Implemented

*** Complexity

*** Less Practical

SUBSTRING SEARCHING

*** Search of a Term

Embedded Within a Term

*** Very Useful Tool

*** To Be Used Only On Subsets
of Data Bases (Selected Sets)

*** Phrase Searching

*** if Proximity Not Available
ON(*)LINE

SUBSTRING SEARCHING (CONT'D)

*** Word Truncation

*** Size of Substring

*** One Character :

CAT(*) ==> CATS

*** "n" Characters:

CAT(2*) ==> CATCH

*** Any Characters:

CAT(*) ==> CATS ...

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

SUBSTRING SEARCHING (CONT'D)

*** Group of Concepts

*** Universal Character

SELECT COMPUT? (DIALOG)

COMPUT: (ORBIT)

COMPUT\$ (BRS)

*** Various Truncation

*** Starting Character(s)

*** Trailing Character(s)

*** Embedded Character(s)

*** Using Inverted File

*** Fragmented Words

*** Beware Irrelevant Answers

*** Example:

CAT and CATERPILLAR

*** Beware Size of Sets:

*** Example:

CON(*), OXY(?), META(\$)...

THESAURUS SEARCHING

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

*** History of NASA Thesaurus

*** Subject Authority List (1962-1967)

*** Uniterm Concept

*** Posting Rules

*** Major/Minor Terms

*** Machine Terms

*** Singular Version

*** NASA Thesaurus (1968 to Present)

*** Joint DOD-NASA Development

*** Plural Version

*** 16,713 Postable Terms

*** 3,716 Non-Postable Terms

*** 40,661 Entry Terms

THESAURUS SEARCHING (CONT'D)

*** Search Enlargement

*** Broader Terms

*** Related Terms

*** Example:

Lungs

BT	Anatomy
	Organs
	Respiration
	Viscera
RT	Alveoli
	Bronchi
	Pleurae
	Spirometers

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

THESAURUS SEARCHING (CONT'D)

*** Search Restriction

*** Narrower Terms

*** Related Terms

*** Example:

Celestial Bodies

NT Moon

Satellites

RT Light Sources

Lunar Orbits

Selenography

THESAURUS SEARCHING (CONT'D)

*** Searchable Fields

*** Major Terms

*** Minor Terms

*** Subject Terms

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

THESAURUS SEARCHING (CONT'D)

*** Expansion Capabilities

*** Entry Terms

*** Alphabetical Listings

*** Spelling Tolerance

*** Entry Vocabulary

*** Not All Postable Terms

*** Thesaurus Terms

*** All Postable Terms

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

DICTIONARY SEARCHING

*** Dictionary Searching

*** Abstract Field

*** Oldest Entries

*** Thesaurus Search

*** Major Terms

*** Minor Terms

*** Dictionary Searching Aids

*** Historical Files

*** Frequency Command

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

RELATIONAL OPERATION USAGE

*** Boolean Logic

*** General Concepts

*** OR Links Related Concepts

OIL OR PETROLEUM

*** AND Links Different Concepts

OIL AND ENVIRONMENT

*** NOT Excludes Some Concepts

ENERGY NOT OIL

*** Venn Diagrams

RELATIONAL OPERATION USAGE (CONT'D)

*** Limits of Logic

*** May Obtain Unexpected Results

*** May Exclude Relevant Materials

*** May Retrieve Irrelevant Materials

*** Example

SELECT "INFORMATION RETRIEVAL" NOT "ORBIT"

RELATIONAL OPERATION USAGE (CONT'D)

*** Implied Concepts

*** Expensive and Lengthy Search

*** Terms in Same Hierarchy

*** Example

SELECT "LANGUAGE" AND "FRENCH"

Result: Returns Only French
References

*** Specialized Data Base

*** Example

SELECT "CHEMISTRY"

Result: Returns Too Many
Non-specific References
or None, Not an Index
Term

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

SEARCH PROFILES / SAVED SEARCH STRATEGIES

- *** One Time Search vs. Saving a Search
 - *** A Query Is Generally Entered Once
 - *** Occasionally, A Searcher Repeats Queries
 - *** Within One Session
 - *** On Different Data Bases
 - *** During Different Sessions
 - *** On Different Data Bases
 - *** On Same Data Base
 - To Check Updates
 - *** Repetitive Use
 - With Small Variations
 - *** Periodical Execution
 - To Retrieve Updates

SEARCH PROFILES / SAVED SEARCH STRATEGIES (CONT'D)

- *** Saving Search Strategies:
 - *** Saves Time
 - *** Guarantee Accuracy of Input
 - *** Strategy Developed Once For All
 - *** Typos Corrected Once For All
 - *** Variation of a Search
 - *** Reduces Online Stress
 - *** Time Pressure Alleviated
 - *** Allows Batch Processing
 - *** Cheaper
 - *** Repetitive Processing For Checking Updates

SEARCH PROFILES / SAVED SEARCH STRATEGIES (CONT'D)

*** Saved Search

*** Current Awareness:

*** Need for Current Information
In a Specific Field

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

SEARCH PROFILES / SAVED SEARCH STRATEGIES (CONT'D)

*** Saved Search (cont'd)

*** Selective Dissemination of Information

*** Check a Set of Queries

*** Regular Intervals

*** Use Updated Fields

*** Frequency of Run Is System
Dependent

*** Match Can Be Exact or
Approximate

*** SDI Checks Update Fields

*** Designed for Specific Data
Base Only

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

SEARCH PROFILES / SAVED SEARCH STRATEGIES (CONT'D)

*** Searching Different Data Bases

*** Which Data Base to Select?

*** Frequency of Occurrence of a Term
Indicated in Many Data Bases

*** Examples

BRS-CROSS

DIALOG-DIALINDEX

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

SEARCH PROFILES / SAVED SEARCH STRATEGIES (CONT'D)

*** Saved Search Strategies

*** The Cycle of Stored Search:

*** Create

*** Save / Name

*** Edit / Modify / Update

*** Execute or Bypass

*** Delete

SEARCH PROFILES / SAVED SEARCH STRATEGIES (CONT'D)

*** Pre-Saving

- *** Specify Intent to Save Search Strategy
- *** When to Start Saving a Search
- *** Begin_Save, Create, End_Save, Execute

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

*** Post-Saving

- *** Enter and Execute Queries
 - *** All Queries Part of Stored Search
 - *** Terminate Search by "Save"
or "End_Save"
 - *** Create, End_Save, Execute

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

REQUEST SETS / SEARCH SETS

*** Request Sets

*** Results of Queries

*** Automatic

*** All Session Sets

*** Manual

*** Choice of User

*** Incorporate in Subsequent Queries

*** Reasons

*** Reference

*** Print Out

*** Save Space

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

REQUEST SETS / SEARCH SETS (CONT'D)

*** Search Expression

*** Combines Commands

*** Word, Term or Set Number

*** Root or Range Searches

*** Phrases in Text or Title

*** Mixture of All

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

SEARCH STATUS

- *** Display Summary of Active Request Sets
 - *** Number of Retrievals Per Set
 - *** Query Which Created Set

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

SEARCH STATUS (CONT'D)

*** Current Status

*** Session Information

*** Date

*** Time

*** File Collection

*** Format Specification

*** User Selected Options / Parameters

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

*
*
* OUTPUT GENERATION FEATURES *
*

OUTPUT GENERATION FEATURES

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Predefined Output Formats

User-Defined Output Formats

Online Vs. Offline Output Generation

Additional Output Generation Features

Printed Index Generation

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*
*
*

SEARCH REVIEW

SEARCH REVIEW

*** Search Request

*** Creates Numbered Set

*** Set Contents

*** Number of Documents Retrieved

*** Pointers to Documents

*** Displays Summary of Requested Sets

*** Sessions Retain Separate Set
Collections

*** Search Review Lists :

*** Number of Each Set

*** Number of Documents Retrieved

*** Request That Created Set

*** History of Strategy

*
*
* PREDEFINED OUTPUT FORMAT *
*

PREDEFINED OUTPUT FORMAT

*** Defined by System

*** Contents

*** Example

Title

Author

Call Number

*** Predetermined

*** Minimum Spacing Between Elements

*** First Physical Print Position

*** Line Size

*** Page Size

*** Column Width Equals

*** Length of Data

*** Length of Column Header

*** Headings Centered

*** Underlined at Proper Places

*** Sorted Output

PREDEFINED OUTPUT FORMATS (CONT'D)

*** Example

Reference List

Page 1

Title	Author	Call Number
Distributed Data Bases	H. Schneider	QA82.8.S97
Information Retrieval	H. Heaps	Z699.H38
An Information System Manifesto	J. Martin	QA76.MB27
An Introduction to Data Base Systems	C. J. Date	QA76.9.D3D37
Managing the Data Base Environment	J. Martin	QA76.9.D3MB6

System Default Format

*
*
* USER-DEFINED OUTPUT FORMATS *
*
*

USER-DEFINED OUTPUT FORMATS

- *** Report Content
 - *** Select Data Elements
 - *** Choose Strings
 - *** Compute Values
 - *** Counts
 - *** Sub Totals
 - *** Totals
 - *** Title and Header Suppressed on New Page
 - *** Choice of
 - *** Default Title
 - *** User Defined Title

USER-DEFINED OUTPUT FORMATS (CONT'D)

*** Data Editing Formats

*** Specifications

*** Line Size

*** Page Size

*** Spacing Factor

*** Underlining Character

*** Header Width

*** Header Centering

*** Maximum Page Length

*** Left / Right Justification

USER-DEFINED OUTPUT FORMATS (CONT'D)

- *** User Created Formats Library
 - *** Data Editing Formats
 - *** Stored on System
 - *** Named with Simple Commands
 - *** Macros Defined
 - *** Library Commands
 - *** Invoked for Desired Display of Report
 - *** Modified for Changing Demands

USER-DEFINED OUTPUT FORMATS (CONT'D)

*** Example

Data Base Systems Sources

Page 1

Author	Title	Date	Pages
Date, C.	Introduction to Data Base Systems	1981	675
Heaps, H.	Information Retrieval	1982	387
Martin, J.	An Information System Manifesto	1983	456
Martin, J.	Managing the Data Base Environment	1984	780
Nijssen, G.	Modelling in Data Base Management Systems	1976	366

User Defined Format

*
*
* ONLINE VS. OFFLINE OUTPUT GENERATION *
*

ONLINE VS. OFFLINE OUTPUT GENERATION

- *** Online Output Generation
 - *** Search Requested on Interactive Terminal
 - *** Output to Interactive Terminal
 - *** User Review
 - *** Determines Accuracy
 - *** Satisfaction with Report Format
 - *** Modification of Output
 - *** Search Request Modified for Accuracy
 - *** Format Modified for Appearance
 - *** Repeat Process
 - *** Accurate Final Output

ONLINE VS. OFFLINE OUTPUT GENERATION (CONT'D)

*** Sample NASA/RECON Language Constructs

display

Syntax: display (set number)/(format)/(range)

Query: display 8/2/all

Result: All Items with Full Citation (Format
2) of Set Number 8 Displayed on Screen.

type

Syntax: type (set number)/(format)/(all)

Query: type 10/2/all

Result: All Items with Full Citation (Format
2) of Set Number 10 Printed on Online
Printer.

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

ONLINE VS. OFFLINE OUTPUT GENERATION (CONT'D)

- *** Offline Output Generation
 - *** Output at Distant Facility
 - *** Data Dictionary Support
 - *** Formulate Search Request
 - *** Accurate Data Field Names
 - *** User Request Submitted
 - *** On Prescribed Form
 - *** To Retrieval Center
 - *** Output Mailed or Delivered at the Facility
 - *** Time Delay

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

ONLINE VS. OFFLINE OUTPUT GENERATION (CONT'D)

*** Comparative Analysis

*** Online

*** Instant Output Checking

*** Commands Modified Real Time

*** Separation of

*** Screen Review

*** Print Functions

*** Offline

*** Time Interval for Output

*** No Screen Review

*
*
* ADDITIONAL OUTPUT GENERATION FEATURES *
*

ADDITIONAL OUTPUT GENERATION FEATURES

- *** Rapid Scan
 - *** Browse Through Retrieved Records
 - *** Before Generating Output
- *** Single Field Print
 - *** Examine Portion of Retrieved Record
 - *** Example
 - Title
 - Subject Terms
 - *** Request Output of Complete Record
- *** Highlighting
 - *** Display of Retrieved Record
 - *** Specific Terms Emphasized
 - *** Underlined
 - *** Starred
- *** Sorting
 - *** Records Ordered
 - *** On User Chosen Fields
- *** Ranking
 - *** Record Search Terms
 - *** Decreasing Order of Frequency

*
*
* PRINTED INDEX GENERATION *
*

PRINTED INDEX GENERATION

- *** Used to Access Document Collections
- *** Simplifies Term Classification
- *** Functions as Thesaurus
- *** Saves System Time
 - *** Generated Only Once
 - *** Facilitates Fast Search
 - *** Index Terms
 - *** Documents Indexed
- *** Generally Large
 - *** Good for Small Data Bases
 - *** Problem for Large Data Bases
- *** Choice of Indices
 - *** KWIC
 - *** KWOC

PRINTED INDEX GENERATION (CONT'D)

*** KWIC

*** Key Word In Context

*** Titles Repeated

*** Alphabetical Arrangement

*** Keywords Highlighted

*** Underlined

*** Double Printed

*** Keywords Centered

*** Titles Permuted Around Keywords

*** Possibly Truncated

*** Example

t Laws Relating to	COMPUTER Processing of Statute La
e Legal Aspects of	COMPUTER Use
Computers and the	COMPUTERS and the Law
cessing of Statute	COMPUTERS
The Patent	ELECTRONIC Computers and the Law
Some	LAW
The	LAW
	LAWS Relating to Computer Use
	LEGAL Aspects of Computers
	PATENT Laws Relating to Computer

[Heaps, H. S., Information Retrieval:
Computational and Theoretical Aspects, Academic
Press, New York, 1978]

PRINTED INDEX GENERATION (CONT'D)

*** KWOC

*** Keyword Out of Context

*** Similar to KWIC

*** Keywords at Margin

*** Natural Word Order

*** Example

COMPUTER	Computer Processing of Statute Law
COMPUTER	The Patent Laws Relating to Computer Use
COMPUTERS	Electronic Computers and the Law
COMPUTERS	Some Legal Aspects of Computers
ELECTRONIC	Electronic Computers and the Law
LAW	Electronic Computers and the Law
LAW	Computer Processing of Statute Law
LAWS	The Patent Laws Relating to Computer Use
LEGAL	Some Legal Aspects of Computers
PATENT	The Patent Laws Relating to Computer Use

[Ibid]

*** HOOK TO DISCIPLINE-SPECIFIC EXAMPLE ***

*
*
* INSTRUCTIONAL AND *
* *
* *
* DIAGNOSTIC FEATURES *
*

INSTRUCTIONAL
AND
DIAGNOSTIC FEATURES

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REFERENCE
LITERATURE

REFERENCE LITERATURE

- *** Users System Literature
 - *** Catalogues of System Facilities
 - *** Operating Systems Reference Manual
 - *** Data Base / IS&R Reference Manual
 - *** Programming Languages Reference Manuals
 - *** Handouts for Beginners
 - *** Handouts for Software Tools
 - *** Word Processors
 - *** Text Editors

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*      ONLINE   FEATURES
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ONLINE FEATURES

*** Online System Documentation

*** Brief Description of System Commands

*** Brief Description of Error Diagnostic Messages

*** Via "HELP" or "EXPLAIN" Commands

*** Online Data Base Documentation

*** Brief Description of Accessible Data Bases

*** Online Training

*** System Tutorials for New User

*** Error Diagnostic Facilities

*** Pre-execution Error Diagnostic Messages

*** Execution-time Error Diagnostic Messages

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LEARNING AIDS

LEARNING AIDS

*** Search Logic Tracing

*** Detailed Description of Retrievals

*** Sample Searches

*** HOOK TO SYSTEM-SPECIFIC EXAMPLE ***

LEARNING AIDS (CONT'D)

*** Example of Search Logic Tracing

IF Author EQ 'Lancaster' AND Abstract CONTAINS
('Information Retrieval' or 'Data Base
Software') AND DATE GE JANUARY, 1978
THEN DISPLAY TITLE;

Yields 0 Hits,

Why and What to do Next ?

Search Logic Trace

1. Author EQ 'Lancaster'	15
2. Abstract CONTAINS 'Information Retrieval'	500
3. Abstract CONTAINS 'Data Base Software'	10
4. Date GE January, 1978	10000
5. 2 OR 3	505
6. 1 AND 5	12
7. 5 AND 4	100
8. 1 AND 4	0
9. 1 AND 5 AND 4	0

LEARNING AIDS (CONT'D)

*** Solutions

- *** For Lancaster Only -
Use an Earlier Cut-Off Date
- *** For Recent Documents -
Add Other Authors

LEARNING AIDS (CONT'D)

*** Live-help

*** Accessibility of System Consultant

*** For Discussion

*** Resolution of Difficulties

*** Monitor Log

*** Record of User's Interactions with the System

*** Provides Feedback to the System Designers

*** Provides the Foundations for System Performance Measurement and Evaluation

*
* ADDITIONAL IS&R APPLICATION AREAS *
*

ADDITIONAL IS&R
APPLICATION AREAS

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Selective Dissemination of Information

Support for Personal Files

Interfaces With Document Delivery Systems

Combined Retrieval Systems

Personal Computing Environment

SELECTIVE DISSEMINATION
OF
INFORMATION

SELECTIVE DISSEMINATION OF INFORMATION

*** Personal Service

*** Meets Individual Information Needs

*** Employs Individual User Profile

*** Relevant Data Retrieved

SELECTIVE DISSEMINATION OF INFORMATION (CONT'D)

*** Machine Aided Dissemination

*** Partially Automated

*** Fully Automated

*** Existence of New Literature

*** Notification to Individuals or Groups

SELECTIVE DISSEMINATION OF INFORMATION (CONT'D)

*** Construction of User Interest Profiles

*** Collect User Interest Information on Pertinent Subjects

*** From Individuals

*** From Groups

*** Prepare Query Request Profiles for Similar Clients

*** Query Retrieves Current References

SELECTIVE DISSEMINATION OF INFORMATION (CONT'D)

*** Modify Interest Profiles to Collect Current References

*** Periodically Modified

*** Quick Reference to New Material

*** Search Strategy

*** Matches User Profiles against Documents

SUPPORT FOR PERSONAL FILES

SUPPORT FOR PERSONAL FILES

- *** Files for Specific Projects
- *** Small Number of References
- *** Provide for User Specification of
 - *** Data Base Definition
 - *** Data Base Interrogation
 - *** Data Base Report Generation
 - *** Data Base Update
 - *** Data Base Redefinition
 - *** Data Base Security Considerations
 - *** Stopwords and Keywords

SUPPORT FOR PERSONAL FILES (CONT'D)

*** Combination of Bibliographic and Data
Management Capabilities

*** Stores and Retrieves

*** Actual Data

*** Analyzed Data

*** Statistical and Graphical Routines for
Analysis

SUPPORT FOR PERSONAL FILES (CONT'D)

*** Characteristics

- *** Consistency of Command Language
- *** Variety of Data Types and Structures
- *** Ease of Use
- *** Flexibility
- *** Supports Tutorial and Diagnostic Aids
- *** Extensive Interrogation and Output Functions
- *** Limited User Community

SUPPORT FOR PERSONAL FILES (CONT'D)

*** Characteristics (Cont'd)

*** Support For

*** Computational Aids

*** Statistical Aids

*** Report Generation Aids

SUPPORT FOR PERSONAL FILES (CONT'D)

* * * Examples

Battelle's BASIS-70

Stanford's SPIRES-||

Northwestern's RIQS

MRI System's SYSTEM-2000

Southwestern Louisiana's MADAM

**INTERFACES
WITH
DOCUMENT DELIVERY
SYSTEMS**

INTERFACES WITH DOCUMENT DELIVERY SYSTEMS

*** Microform Storage

*** Equipment for Microform Storage and Retrieval

*** Microfilm

*** Microfiche

*** Large Volume of Information Stored

*** Used to Store Unchanged Data

*** No Rewriting

*** No Erasing

INTERFACES WITH DOCUMENT DELIVERY SYSTEMS (CONT'D)

*** Paper Copy Produced on Demand

*** Microform_to_paper Conversion Device

*** Every Microfiche Indexed

*** Random Access Using Index Numbers

*** Data Viewed on Special Reading Equipment

*** Microfilm Copy Can Be Developed

INTERFACES WITH DOCUMENT DELIVERY SYSTEMS (CONT'D)

*** Video Disks

*** Used to Store Large Volume of Data

*** Approximately 1 Billion Characters

*** Large Storage Capacity at Low Cost

*** No Rewriting

*** Mechanical Duplication

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*      COMBINED
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*
*      RETRIEVAL SYSTEMS
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COMBINED RETRIEVAL SYSTEMS

- *** Interconnection of Information Facilities
 - *** Bibliographic
 - *** Data Base Management
 - *** Data Analysis
 - *** Citation Indexing
 - *** Text Processing
- *** User Must Understand
 - *** Capabilities of Different Systems
 - *** Instructional and Diagnostic Features

COMBINED RETRIEVAL SYSTEMS (Cont'd)

*** User Retrieves

*** Bibliographic Textual Data

*** Numeric Data

*** Statistical Analysis

*** Common Interface

*** User Formulates Common Language Request

*** Submitted to Common Interface

*** Translated to Different Internal
Command Languages

*** User Freed from Different Command Languages

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PERSONAL COMPUTING
ENVIRONMENTS

PERSONAL COMPUTING ENVIRONMENTS

- *** Personal Computer Connected to Remote IS&R System
- *** User Works on Personal Computer
- *** Data Retrieved into Personal Computer Storage
 - *** Information Downloaded
- *** Characteristics
 - *** Reduction of Paper
 - *** Flexible Usage
 - *** Avoids Resource Allocation Problems of Large Computer

PERSONAL COMPUTING ENVIRONMENTS (Cont'd)

*** Functions

*** Organize Documents

*** Search Stored Information

*** Create Local Files

PERSONAL COMPUTING ENVIRONMENTS (Cont'd)

*** Prestored Procedures

*** Login and Logout to IS&R System

*** Sample Searches

*** Security

*** Access Rights

*** Checked before Downloading

*** Personal Computer Files Available
to All Users

*** Copyrights

*** Decentralized Uncontrolled Data

*** Possibility for Violation

I S & R

PERFORMANCE MEASUREMENT AND EVALUATION

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*****
FME LIFE CYCLE
*****

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FME LIFE CYCLE

TABLE OF CONTENTS

Basic Concepts

Define Generic Objectives

Determine Measurement Parameters

Select Measurement Tools

Identify Data Analysis Tools

Design and Conduct of Experiments

Perform Data Analysis and Evaluation Activities

Identify and Implement Improvements

Repeat Cycle

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BASIC CONCEPTS

*** Purposes of FME

*** Determining Actual Performance

*** Projecting Performance

*** Improving Capabilities of System

*** Performance

*** How Well System Works

*** Equivalent of Value

*** Subjective Concept

*** Objectively Evaluated

*** Measurement

*** Act or Process of Measuring

BASIC CONCEPTS (CONT'D)

*** Evaluation

*** Analyzing Functioning of System

*** Analyzing Usage of System

*** Analyzing Attainment of Design
Objectives

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*
*      DEFINE
*
*      GENERIC OBJECTIVES
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DEFINE GENERIC OBJECTIVES

*** Environment Definition

*** Needs Analysis

*** Problem Definition

*** Objectives Defined

*** Goals

*** Measure and Evaluate Execution
Efficiency of System

DEFINE GENERIC OBJECTIVES (CONT'D)

*** Goals (cont'd)

*** Measure and Evaluate User Interaction

*** Identify Usage Patterns

*** Identify Error Patterns

*** Evaluate User Satisfaction

*** Evaluate User Success

*** Translation to Detailed Measurement
Parameters

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**DETERMINE
MEASUREMENT PARAMETERS**

DETERMINE MEASUREMENT PARAMETERS

- *** Dictated by Generic Objectives
- *** Objectives under Evaluation
- *** Efficiency Measurement Parameters
 - *** Response Time
 - *** CPU Time
 - *** I/O Time
 - *** User Time
 - *** Execution Cost

MEASUREMENT PARAMETERS (CONT'D)

*** Usability Measurement Parameters

*** Completeness of Output

*** Total Number of User Errors

*** Number of Errors of Each Type

*** Frequency of Errors

*** Quality of Error Diagnosis

*** Quality of Error Recovery Assistance

*** Complexity of Search Language Constructs

*** Quality of Online Training

*** User Ratings of Session

*** User Comments of Session

MEASUREMENT PARAMETERS (CONT'D)

*** Data to Support Measurement Parameters

*** Session Number

*** Transaction Number

*** Date of Access

*** CPU Time at Start of Session

*** File Name Accessed

*** Total Records / Words in File

*** Number of Records Scanned

*** User Personal Information

*** Search Text

*** Entire User / System Dialogue

*** CPU Time at End of Session

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SELECT MEASUREMENT TOOLS

SELECT MEASUREMENT TOOLS

*** Potential Measurement Tools

*** Manual Methods

*** Questionnaires

*** Interviews

*** Evaluation Forms

*** Check Lists

*** User Comments

*** Automated Methods

*** Hardware Monitor

*** Software Monitor

SELECT MEASUREMENT TOOLS (CONT'D)

*** Characteristics of Measurement Tools

*** Interference

*** Use System Resources

*** Interfere with System Operation

*** Effect System Performance

*** Accuracy

*** Sufficient Precision of Variables

*** Collection of Relevant Data

*** Resolution

*** Frequency of Recording Data

*** Cost

SELECT MEASUREMENT TOOLS (CONT'D)

*** Rank and Select Measurement Tools

*** Based on Evaluation Objectives

*** Based on Characteristics of Tool

*** Based on Support For Data Collection

*** Based on Suitability to Data Analysis

*
*
* IDENTIFY DATA *
*
* ANALYSIS ACTIVITIES *
*

IDENTIFY DATA ANALYSIS TECHNIQUES

*** Data Analysis Techniques

*** Useful for

*** Organization of Data

*** Interpretation of Data

*** Frequency Distributions

*** Basic Statistics

*** Mean

*** Median

*** Mode

*** Variance

*** Standard Deviation

IDENTIFY DATA ANALYSIS TECHNIQUES (CONT'D)

*** Advanced Statistical Analysis

*** Test of Significance

*** Analysis of Variance

*** Regression Analysis

*** Data Presentation Tools

*** Graphical Representations

*** Plots

*** Scattergrams

*** Histograms

*** Pie Charts

*** Tables of Results

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DESIGN AND
CONDUCT EXPERIMENTS

DESIGN AND CONDUCT EXPERIMENTS

*** Design of Experiments

*** Develop Pre-Usage Questionnaires

*** Develop Post-Usage Questionnaires

*** Determine Experiment Duration

*** Determine Experimental Environment

*** Conduct of Experiment

*** Activate Automated Performance
Monitoring Facilities

*** Conduct Pre-Usage and Post-Usage
Questionnaire Survey

*** Perform Appropriate Data Analysis

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*   PERFORM DATA ANALYSIS
*
*   AND
*
*   EVALUATION ACTIVITIES
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PERFORM DATA ANALYSIS AND EVALUATION ACTIVITIES

*** Recall and Precision Analysis

*** Measures Relative Benefits of Types of Indexing

*** Title Search Versus Abstract Search

*** Title Search Versus Keywords Search

*** Title Search Versus Full Record Search

*** Full Word Indexing Versus Substring Indexing

*** Failure Analysis

*** Examines How Documents Are Indexed

*** Examines How User Request Was Phrased

*** Identifies Appropriate Search Strategy

*** Makes Comparisons

*** Draws Conclusions

PERFORM DATA ANALYSIS AND EVALUATION ACTIVITIES

*** User Assessments

*** Overall User Success

*** Overall User Satisfaction

*** Error Analysis

*** Identification of Learning Curves

*** Comparison of Learning Curves with
Previous Experience

*** Simple Measures of User Success

*** Unit Cost (Time Spent) Per Relevant
Document Retrieved

*** Unit Cost (Dollars) Per Relevant
Document Retrieved

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*
* IDENTIFY AND IMPLEMENT *
* IMPROVEMENTS *
*

IDENTIFY AND IMPLEMENT IMPROVEMENTS

- *** Identify System Bottlenecks
- *** Identify User Interaction Problems
- *** Identify Measurement Tool Improvements
- *** Improve System Execution Efficiency
- *** Improve Measurement Tool Capabilities
- *** Improve Experimental Techniques
- *** Improve User Overall Success

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*                                     *  
*          REPEAT FME CYCLE          *  
*                                     *  
*                                     *  
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REPEAT FME CYCLE

*** The Whole Cycle is Repeated

*
* TRADITIONAL OBTRUSIVE *
* USER MONITORING *
*

TRADITIONAL OBTRUSIVE USER MONITORING

TABLE OF CONTENTS

Basic Concepts

Subjective User Assessments

Use of Human Subjects

Controlled Usage Experiments

Recall and Precision Analysis

Failure Analysis

Data Base Coverage Analysis

BASIC CONCEPTS

BASIC CONCEPTS

*** Monitors Primary Tasks

- *** Collection of Usage Profiles

- *** Collection of Data to Support

 - *** System Performance Evaluation

 - *** Data Base Performance Evaluation

*** Improves User Productivity

- *** Optimizing System Performance

- *** Optimizing Data Base Structuring

BASIC CONCEPTS (CONT'D)

*** Apparent to User

*** Requires User Response

*** User Is Aware of Monitoring

*** Interference with Interaction

*** May Interrupt User Thought Flow

*** May Inhibit User Actions

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SUBJECTIVE
USER
ASSESSMENTS

SUBJECTIVE USER ASSESSMENTS

*** Questionnaires and Ratings

*** Content of Information

*** Validity of Information

*** Interactive Comments

*** Interference Effects

*** User's Motivation

*** Usefulness of Interactive Comments

*** Immediate Opportunity for
User Feedback

*** Identification of Common
Problems

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USE OF HUMAN
SUBJECTS

USE OF HUMAN SUBJECTS

*** Psychological Considerations

*** Human Perception Models

*** Human Behavior Characteristics

*** Variability Control

*** Psychological Profiles of Groups

*** Compensation for Differences

*** Confidentiality Considerations

*** Legal and Moral Factors

*** Impact on User Actions

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*
* CONTROLLED
*
* USAGE
*
* EXPERIMENTS
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* * * * *

CONTROLLED USAGE EXPERIMENTS

*** Design Decisions

*** Isolate Factors to Be Studied

*** Identify Contributing Factors

*** Determine Methods of Varying Factors

*** Basis for Experimental Grouping

*** Ability

*** Experience

CONTROLLED USAGE EXPERIMENTS (CONT'D)

*** Control of Environment

*** Identify External Factors

*** Eliminate Effect or Compensate

*** Generalizing Results

*** Identify Differences

*** Real World

*** Experimental World

*** Adjust for Differences

*** Correlations with Real World

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*
*          RECALL AND PRECISION
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*
*        ANALYSIS
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RECALL AND PRECISION ANALYSIS

*** Recall Analysis

*** Recall Ratio =

$$\frac{\text{Number of Relevant Documents Retrieved}}{\text{Number of Relevant Documents in the Data Base}} \times 100$$

$$\text{RECALL} = (7/10) \times 100 = 70\%$$

*** Precision Analysis

*** Precision Ratio =

$$\frac{\text{Number of Relevant Documents Retrieved}}{\text{Number of Documents Retrieved}} \times 100 \text{ Total}$$

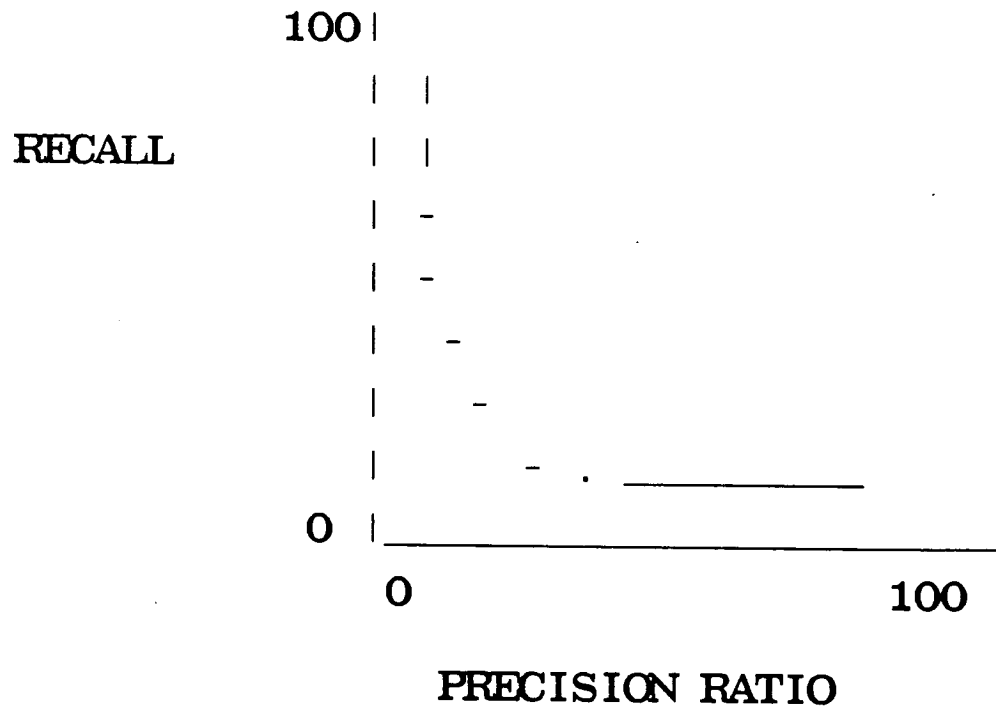
$$\text{PRECISION} = (7/70) \times 100 = 10\%$$

RECALL AND PRECISION ANALYSIS (CONT'D)

*** Recall vs. Precision

*** Recall and Precision Tend to Vary Inversely

TYPICAL RECALL/PRECISION PLOT:



*** Online IS&R Systems - Oriented toward High Precision

*** Offline IS&R Systems - Oriented toward High Recall

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FAILURE ANALYSIS

FAILURE ANALYSIS

*** Correlation to Recall and Precision Analysis

*** Analyze Indexing Accuracy

*** Analyze User Search Strategy

*** Feedback for System Improvements

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*
* DATA BASE COVERAGE ANALYSIS *
*

DATA BASE COVERAGE ANALYSIS

*** Coverage Definition :

Data Base Content

----- X 100 All

Relevant Information

*** Problems

*** Determining Extent of "All Relevant
Information"

*** Data Base Administrator
Function

*** Advice from Information
Specialist

*** Determining Data Base Content

*
* ADVANCED UNOBTRUSIVE *
* *
* USER MONITORING *
*

ADVANCED UNOBTRUSIVE USER MONITORING

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Basic Concepts

Unobtrusive Software Monitoring Facilities

Quasi-Controlled Usage Experiments

System Usage Profile Analysis

Timing Analysis

User Error and Error Recovery Analysis

Utilization of Results

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* BASIC *
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BASIC CONCEPTS

*** Transparent to User

*** Data Collected by Software Monitor

*** Imbedded in System Software

*** External to System

*** No Interference with Interaction

*
* UNOBTRUSIVE SOFTWARE *
*
* MONITORING FACILITIES *
*

UNOBTRUSIVE SOFTWARE MONITORING FACILITIES

*** Parameters

*** User Error and Error Recovery Data

*** Error Types

*** Error Context

*** User Response to Error

*** Subsequent Error Patterns

*** Timing Data

*** System Response Times

*** User Response and Think Times

*** Retrieval Logs

*** Extrapolate Task Success from Retrieval Success

*** Display of Retrieved Information

UNOBTRUSIVE SOFTWARE MONITORING FACILITIES (CONT'D)

*** Characteristics

*** Levels of Transparency

*** User Aware of Monitoring

*** User Repeatedly Warned about
Monitoring

*** Validation of Data

*** Monitors Must Recover from
Abnormal Termination

*** Rollback of Terminated
Sequences

*** Removal of Invalid Data

UNOBTRUSIVE SOFTWARE MONITORING FACILITIES (CONT'D)

*** Software Engineering Techniques

*** Usually Applied to Standard Software
Systems

*** Characteristics Measured

*** Reliability

*** Partially Host-Dependent in DEMS

*** Correctness

*** Learnability

*** Usability

UNOBTRUSIVE SOFTWARE MONITORING FACILITIES (CONT'D)

*** Characteristics Measured (cont'd)

*** Flexibility

*** Modifiable

*** Portable

*** Performance

*** Applicability

*** Potential for User Success

*** Security and Protection

*** May Be Host-Dependent

*** Cost-Effectiveness

*** User's time

*** CPU Time

*
* QUASI - CONTROLLED *
* *
* USAGE EXPERIMENTS *
* *

QUASI-CONTROLLED USAGE EXPERIMENTS

*** Subject Grouping

*** Based on Background

*** Based on Performance

*** Experimental Design

*** Subjects Given Tasks to Perform

*** Task Performance Uncontrolled

*** Measure Success

QUASI-CONTROLLED USAGE EXPERIMENTS (CONT'D)

*** Definition of Tasks

*** Must be Based on Patterns in Interaction

*** Task Termination Defined

*** Changes in Pattern

*** Use of Terminating Command

*** Print or Display of Information

*** Usefulness

*** Measure User Success

*** Successful Tasks / Total Tasks

*** Time Required to Complete Task

*** Commands Required to Complete Task

QUASI-CONTROLLED USAGE EXPERIMENTS (CONT'D)

*** Advantages

- *** Less Demanding on Experimenter

- *** Can Collect Large Amounts of Data

*** Disadvantages

- *** Task Determination Problems

- *** Effect of Uncontrolled Factors

SYSTEM USAGE PROFILE ANALYSIS

SYSTEM USAGE PROFILE ANALYSIS

- *** Commands and Features Used
- *** Advanced Users Have Greater Range of Commands
- *** Increase in Size of Active Command Set
 - *** Rapid at First
 - *** Stabilizes with Time
- *** Correlations
 - *** Complexity of Entire Command and Function Set
 - *** Availability of Multi-Level Interfaces

SYSTEM USAGE PROFILE ANALYSIS (CONT'D)

*** Data Bases Utilized

*** Determine Which Data Bases Used

*** Measure User's Frequency of Access to
Data Bases

SYSTEM USAGE PROFILE ANALYSIS (CONT'D)

*** Identifying Typical Patterns of Usage

*** Determine User Classification

*** Use Monitor Log Information for
Other Users in Same Classification

*** Compare to User's Past Patterns

*** Deviations from Pattern

*** May Indicate Change in User Category

*** May Indicate User Problem

*** Identify Problem Type

*** Possible Re-training Required

SYSTEM USAGE PROFILE ANALYSIS (CONT'D)

*** Determine User Proficiency

*** Error Levels

*** Task Accomplishment Efficiency

*** Progress over Time

*** Measure Learnability

*** Characteristics of Learning Stage

*** Utilization of New Commands

*** Utilization of New Features

*** Error Rates

*** Utilization of Help Commands

SYSTEM USAGE PROFILE ANALYSIS (CONT'D)

*** Identifying End of Learning Stage

*** Usage of New Commands and Features
Tapers Off

*** Less Frequent Errors

*** Little Use of Help Commands

*** Process Is Repeated As User Moves to New
Interface Levels

SYSTEM USAGE PROFILE ANALYSIS (CONT'D)

*** Measure Usability

*** Impact of Usability on Learnability

*** Usability Measurements Are
Primarily Post-Learning

*** Parameters

*** Memory Retention of Commands

*** Cost / Benefit Analysis

*** Task Accomplishment Analysis

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*      TIMING ANALYSIS
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TIMING ANALYSIS

*** System Response Times

*** Vary with System Load

*** Acceptable Ranges

*** Vary with Task Type

*** Vary with Different User Types

*** Time / Cost Analysis

*** Real Time

*** CPU Time

*** User Response and Think Times

*
* USER ERROR *
* AND ERROR *
* RECOVERY ANALYSIS *

USER ERROR AND ERROR RECOVERY ANALYSIS

*** Limitations

*** Cannot Measure Logic Errors

*** Can Measure Syntax Errors

*** User Motivation

*** Information Usually Lacking

*** Available in Controlled Experiments

USER ERROR AND ERROR RECOVERY ANALYSIS (CONT'D)

*** Parameters

*** Error Rate

*** Measure Changes over Time

*** Types of Errors

*** Identify Common Errors

*** Context of Errors

*** Evaluate Command Series

*** Use of Help Commands

*** Indicates Learning

USER ERROR AND ERROR RECOVERY ANALYSIS (CONT'D)

*** Recovery

*** Monitor Activity after Error

*** Decrease of Similar Errors

*** Subsequent Search Success

*** Implies Successful Help Command

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UTILIZATION OF RESULTS

UTILIZATION OF RESULTS

*** System Modification

*** Difficult in Implemented System

*** System Administrator Function

*** Modification of Data Base

*** Less Difficult than System Change

*** May Involve Changes at Several Different Levels

*** Difficulty Considerable

*** Future Design Decision-Making

*** Feedback to System Designers

*** Continuous Cycle

FUTURE
INFORMATION STORAGE
AND
RETRIEVAL SYSTEMS

FUTURE
INFORMATION STORAGE
AND
RETRIEVAL SYSTEMS

TABLE OF CONTENTS

Languages For Retrieval

Alternative User Interfaces

PC Environments

Knowledge-Based Systems

Networks / Distributed Systems

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*
* LANGUAGES
*
* FOR
*
* RETRIEVAL
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LANGUAGES FOR RETRIEVAL

- *** Common Command Languages
 - *** Multiple System Access
 - *** One Language to Learn
 - *** Flexible
 - *** Addition of New Terms
 - *** Addition of New Features
 - *** Simpler Hook-Up Procedures
- *** Implementations
 - *** Microcomputer Front-End
 - *** Intelligent Terminals
 - *** Networks
 - *** Mainframe Processors
 - *** Gateway Systems
- *** Maximum Utilization
 - *** Easy Retrieval
 - *** Automatic System Switching

LANGUAGES FOR RETRIEVAL (CONT'D)

- *** Natural Languages
 - *** Informal English Format
 - *** Large Vocabulary
 - *** Learning Ability
 - *** Purposes
 - *** Aimed to Casual User
 - *** No Specific Knowledge
 - *** Advantages
 - *** Less Training
 - *** Fewer Errors
 - *** Better User/Machine Interface
 - *** Disadvantages
 - *** Complexity
 - *** Time Overhead
 - *** Response Slower
 - *** More Expensive
 - *** Possible Confusion

LANGUAGES FOR RETRIEVAL (CONT'D)

*** Natural Language Requirements

*** Dictionary

*** Known Words / Terms

*** Relationships

*** Syntax Forms

*** Term Syntax

*** Keywords

*** Stopwords

*** Noisewords

*** Semantics Information

*** Allowable Forms

*** Combinations

LANGUAGES FOR RETRIEVAL (CONT'D)

*** Special Character Languages

*** Allow Retrieval of Non-English Documents

*** Examples

Chinese

Arabic

Russian

*** Special Symbols Languages

*** Examples

Mathematics

Sciences

*** Better Retrieval Performance

*** Improved Recall

*** Flexible

*** Needs Special Software / Hardware

*** Special Graphics Display

*** Special Keyboard

*** Specific Dictionaries

LANGUAGES FOR RETRIEVAL (CONT'D)

*** Multiple Purpose Languages

*** Integrate IS&R with:

*** Statistical Packages

*** Graphics Packages

*** Text Processors

*** Utilities

*** Provide Common Environment

*** Retrieve Data

*** Process Data

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*      ALTERNATE
*
*      USER
*
*      INTERFACES
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ALTERNATE USER INTERFACES

*** Graphics Displays

- *** Improve Man / Machine Interface

- *** Better Quality of Image

 - *** Output Formats

 - *** Different Colors

- *** Picture Displays

 - *** Video Disk Technology

 - *** Microfilm

- *** Increased Cost

 - *** Device Cost

 - *** Host CPU Time

- *** More Effective

 - *** Keeps User Interest

 - *** Increases Performance

 - *** Displays Variety of Symbols

 - *** Alternate Characters

 - *** Special Symbols

ALTERNATE USER INTERFACES (CONT'D)

- *** Graphics Input Devices
 - *** No Typing Required
 - *** No Misspellings / Errors
 - *** Slow Processing
 - *** User Must
 - *** Read Screen
 - *** Select Items
 - *** Point Screen
- *** User Devices
 - *** Light Pen
 - *** Point at Screen
 - *** Mouse
 - *** Move on Table
 - *** Finger-Touch
 - *** Touch Screen
- *** Effective for Casual Users

ALTERNATE USER INTERFACES (CONT'D)

- *** Voice / Text Recognition
 - *** Highly Advanced Interfaces
 - *** Still in Experimental Form
- *** Voice Recognition
 - *** Allow Oral Communication
 - *** No Typing or Pointing
 - *** Science Fiction
- *** Text Recognition
 - *** Machines Can Recognize
 - *** Typed Text
 - *** Hand-Written Text
 - *** Already Existing Devices
 - *** Optical Character Readers
 - *** Special Pens / Tablets

ALTERNATE USER INTERFACES (CONT'D)

*** TV and Video Interfaces

*** Display Stored Images

*** Display / Retrieve Specialized Documents

*** Pictures

*** Diagrams

*** Drawings

*** Plans

*** Need Advanced Technology

*** Video Disk Storage

*** Microfilm

*** Best with Document Delivery Systems

*** User Sees Full Text

*** User-Selectable Parts Only

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PC
ENVIRONMENTS

PC ENVIRONMENTS

Considerations

*** Intelligent Terminals

- *** Limited Local Processing
- *** No Store / Load Operations
- *** No Stand-Alone Configuration

*** Pc-Based Interfaces

- *** Good Local Performance
- *** Store / Load Possible
- *** Stand-Alone Configuration

*** Advantages

- *** Non-Specialized Workstations
- *** Common Command Languages
- *** Easier Connect Procedures
- *** Cost Benefit

*** Good Availability

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*      KNOWLEDGE
*
*      BASED
*
*      SYSTEMS
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KNOWLEDGE BASED SYSTEMS

*** Intelligent Gateways

- *** Automatic System Selection
- *** Automatic Database Selection
- *** No Need for Manual Dial-Up
- *** No Need to Know Where
Information Resides
- *** Network Schemas

*** Common Command Languages

- *** Automatic Translation
- *** One Interface Only
- *** Reduced Training
- *** Reduced Expenses
 - *** PC-Based Workstations
 - *** Hang-Up after Retrieval
 - *** File Transfer
- *** Automatic Term Addition
 - *** System Can Learn New Term
 - *** Common Dictionaries
 - *** Private Dictionaries

KNOWLEDGE BASED SYSTEMS (CONT'D)

*** Natural Languages

*** Advantages of Learning Systems

*** System Is Able to:

*** Correct Errors

*** Correct Misspellings

*** Syntax / Semantic Query Errors

*** Give Better Error Messages

*** Improve Man / Machine Interface

*** Other Knowledge-Based Applications

*** Query Optimization

*** Best Performance Queries

*** References to Previous Queries

*** User Advising

*** Online Help

*** Online Training

*** Intelligent Diagnostics

KNOWLEDGE BASED SYSTEMS (CONT'D)

*** Knowledge Representations

*** Frames

- *** All Information on One Entity

- *** Thesaurus-like

*** Rules

- *** Semantic Relationships

- *** Syntax Structure Forms

*** Transition Networks

- *** Relationships Between Entities

- *** Possible Combinations

*** Processing

*** Traditional

- *** Regular Programs

- *** User-Created

*** Commercial Products

*** Special Cases

- *** Inference Engines

- *** Dedicated Front-Ends

DISTRIBUTED
AND NETWORK
SYSTEMS

DISTRIBUTED AND NETWORK SYSTEMS

*** Network Configurations

- *** Star
- *** Ring
- *** Bus

*** Network Sizes

- *** Local Area Networks
- *** Large Networks
- *** International Networks

*** Hardware

- *** Special Network Processors
- *** Communications Processor
- *** Front-End Processor
- *** Data Links

*** Software

- *** Distributed Data Bases
- *** Access Control
- *** Conversion Protocols

DISTRIBUTED AND NETWORK SYSTEMS (CONT'D)

*** Local Data Bases

- *** No Need for Remote Dial-Up
- *** Reduces Cost
- *** Data Sources
 - *** Mainframe Downloading
 - *** Locally Developed

*** Local / Remote Processing

- *** Flexible
- *** Process on Site
- *** Process Remote

ATTACHMENT 3.6

**COURSE DEVELOPMENT PHASE:
FIRST DRAFT OF PROPOSED
COURSE LESSON PLANS**

N A S A

N A S A

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*
*           N A S A   /   R E C O N
*
*   C O U R S E   D E V E L O P M E N T   S E R I E S
*
*
*           F I R S T   D R A F T :
*
*   P R O P O S E D   C O U R S E
*
*           L E S S O N   P L A N S
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The NASA/RECON Course Development Series contains a collection of draft course development deliverables representing draft results of the educational course development activities being conducted pursuant to the specifications of National Aeronautics and Space Administration Contract Number NASW-3846.

The entries within this series are in "draft" form; they represent work in progress and work in various stages of revision. As such, they should not be construed as final products nor should they be viewed as material for widespread distribution. All entries within this series will be subjected to multiple development phase revisions, to course pilot administration, and to final course pilot evaluation and final revision prior to being distributed as final course deliverables.

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C O U R S E

D E V E L O P M E N T

CLASS SCHEDULE

<u>CLASS</u>	<u>SUBJECT MATTER</u>
1.	Course Overview
2.	Conventional Research Tools
3.	Information Retrieval Using Computers
4.	User Categorization
5.	Data Models
6.	Logical Data / Physical Storage Structures
7.	Data Base Definition
8.	Data Base Interrogation
9.	Data Base Interrogation
10.	Data Base Report Generation
11.	Data Base Update
12.	Data Base Redefinition / Administrative Functions
13.	Data Base Security
14.	Data Base Security

15. Performance Measurement & Evaluation
16. **** TEST1 ****
17. Bibliographic Data Base Design
18. Bibliographic Data Base Design / Return Test
19. Bibliographic File Structures
20. Bibliographic File Structures
21. Vocabulary Control
22. Vocabulary Control
23. Vocabulary Control
24. Vocabulary Control
25. Bibliographic Data Base Searching
26. Bibliographic Data Base Searching
27. Search Formulation Features
28. Search Formulation Features
29. Search Formulation Features
30. Search Formulation Features
31. Search Formulation Features

- 32. Search Formulation Features
- 33. **** TEST2 ****
- 34. Output Generation Features
- 35. Output Generation Features / Return Test
- 36. Instructional & Diagnostic Features
- 37. Additional IS&R Application Areas
- 38. Additional IS&R Application Areas
- 39. Phases of the PME Life Cycle
- 40. Phases of the PME Life Cycle
- 41. Traditional Obtrusive User Monitoring
- 42. Traditional Obtrusive User Monitoring
- 43. Unobtrusive User Monitoring
- 44. Unobtrusive User Monitoring
- 45. Futures
- 46. Futures
- 47. Futures
- 48. **** FINAL EXAMINATION ****

LESSON PLANS

CLASS NO. 1

SUBJECT Course Overview

TOPICS Survey of Course Material, Objectives, and Policies

TIME 1 hour

MAJOR OBJECTIVE(S): To provide a brief explanation of the information to be presented and the work expected from the students in the coming semester.

SPECIFIC OBJECTIVES:

1. The students will be exposed to the major topics to be covered in the course.
2. The students will understand the class policies on grading, attendance, testing, etc.
3. The students will be informed of the schedule of class activities.
4. The learners will be able to identify the systems to be studied.

RESOURCE MATERIALS NEEDED:

1. Visuals
2. Instructor policies handout.

RECOMMENDED READINGS:

None

OUTSTANDING HOMEWORK: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion

--INSTRUCTOR ORIENTED--

1. Foil presentation

SUMMARY OF LESSON:

The lesson will present a brief overview of the course material and the policies of the instructor.

FOCAL POINTS (test areas):

1. Participating systems.

INSTRUCTOR'S NOTES

LESSON PLANS

CLASS NO. 2

SUBJECT Conventional Research Tools

TOPICS Reference Tools, Card Catalogue, and Library

TIME 1 hour

MAJOR OBJECTIVE(S): To motivate the study and use of automated research tools.

SPECIFIC OBJECTIVES:

1. The learner will understand the difficulties of performing manual research.
2. The learner will be able to locate specific material in the school library.
3. The learner will appreciate the length of time required to conduct library research.
4. The learner will be familiar with the physical arrangement of his school library.

RESOURCE MATERIALS NEEDED:

1. Visuals
2. Free Government leaflets

RECOMMENDED READINGS:

None.

OUTSTANDING ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Examples of complexity of conducting manual searches

SUMMARY OF LESSON:

The lesson will present the difficulties of manual research and familiarize the student with the physical layout of his school library.

FOCAL POINTS (test areas):

1. Reference tools.
2. The Card Catalogue

INSTRUCTOR'S NOTES

LESSON PLANS

CLASS NO. 3

SUBJECT Information Retrieval Using Computers

TOPICS Use of computers for conducting research

TIME 1 hour

MAJOR OBJECTIVE(S): To provide a general picture of the variety of systems in use.

SPECIFIC OBJECTIVES:

1. The learner will be able to identify the uses of information systems.
2. The learner will be able to recognize some major information systems.
3. The learner will understand some of the advantages of automated information retrieval.

RESOURCE MATERIALS NEEDED:

1. Visuals
2. Comparison of Systems Handout.

RECOMMENDED READINGS:

None

OUTSTANDING ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion

--INSTRUCTOR ORIENTED--

1. Foil presentation

SUMMARY OF LESSON:

The lesson will present some major information systems, their histories, and some advantages of computerized research.

FOCAL POINTS (test areas):

1. Advantages of computerized systems.
2. Types of data bases.
3. Comparison of commands.

INSTRUCTOR'S NOTES

LESSON PLANS

CLASS NO. 4

SUBJECT User Categorization

TOPICS Rationale, Categorization Parameters, and Category Definitions

TIME 1 hour

MAJOR OBJECTIVE(S): To justify multiple user categories and define the different types of users of information systems.

SPECIFIC OBJECTIVES:

1. The learner will understand that information systems must serve the needs of a heterogeneous population.
2. The learner will be able to identify and define different classes of users.

RESOURCE MATERIALS NEEDED:

1. Visuals

RECOMMENDED READINGS:

Information Retrieval System (chapter 23) by F. W. Lancaster.

Analysis and Design of Information Systems (page 10-11) by J. A. Senn.

OUTSTANDING ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Examples of different type of users

SUMMARY OF LESSON:

The lesson will discuss the different user requirements, the rationale behind their requirements, and the different functions of each user category.

FOCAL POINTS (test areas):

1. User requirements.
2. User functions.
3. User categories.
4. Needs of each category of users.

INSTRUCTOR'S NOTES

LESSON PLANS

CLASS NO. 5

SUBJECT Data Models

TOPIC Data Models

TIME 1 hour

MAJOR OBJECTIVE(S): To identify different data models in designing information storage and retrieval systems.

SPECIFIC OBJECTIVES:

1. The learner will understand the basic concepts of data modeling.
2. The learner will be exposed to the different data models.
3. The learner will understand the similarities and differences between data models.

RESOURCE MATERIALS NEEDED:

1. Visuals

RECOMMENDED READINGS:

Computer Data-Base Organization (chapter 1,2,3,6) by James Martin.

Database Management by Editorial Staff of Auerbach Publishers Inc.

OUTSTANDING ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion

--INSTRUCTOR ORIENTED--

1. Foil presentation

SUMMARY OF LESSON:

The lesson will discuss the characteristics of the different data models. Also will present the similarities and differences between data models.

FOCAL POINTS (test areas):

1. Similarities and differences between data models.

INSTRUCTOR'S NOTES

LESSON PLANS

CLASS NO. 6

SUBJECT Logical Data and Physical Storage Structures

TOPIC Logical Data and Physical Storage Structures

TIME 1 hour

MAJOR OBJECTIVE(S): To introduce the concepts of logical and physical data structures and accessing methods.

SPECIFIC OBJECTIVES:

1. Understand the concepts of logical and physical structures.
2. Understand the definition of each level of logical data structure.
3. Understand the hierarchy of logical data structure.
4. Understand the data representation and characteristics.
5. Understand storage structures.
6. Understand accessing techniques.

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Comparison Handouts.

RECOMMENDED READINGS:

Computer Database Organization by James Martin.

Database Management Systems by Leo J. Cohen.

Database Management by the Editorial Staff of Auerbach Publishers Inc.

OUTSTANDING ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion

--INSTRUCTOR ORIENTED--

1. Foil presentation

SUMMARY OF LESSON:

The lesson summarizes the logical data structures and data structure levels. It also discusses the physical storage structures and introduces the concepts of data representation and accessing techniques.

FOCAL POINTS (test areas):

1. Data structure levels.
2. Data representation.
3. Storage structuring techniques.
4. Accessing techniques.

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 7

SUBJECT Data Base Definition

TOPIC Data Base Definition

TIME 1 hour

MAJOR OBJECTIVE(S): To give student an idea of the different elements related to the process of defining a database.

SPECIFIC OBJECTIVES:

1. The learner will understand concepts behind data non-redundancy, data consistency, and data independence.
2. The learner will understand schema and subschema definition.

RESOURCE MATERIALS NEEDED:

1. Visuals.

RECOMMENDED READINGS:

Computer Data-Base Organization by James Martin.

Introduction to Information Systems Development (chapter 9) by
James A. Senn.

OUTSTANDING ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note_taking.
2. Discussion.

--INSTRUCTOR ORIENTED--

1. Foil presentation.

SUMMARY OF LESSON:

The lesson introduces some basic concepts about data base
definition.

FOCAL POINTS (test areas):

1. Data non-redundancy.
2. Schema and subschema
3. Data indexing
4. Data base definition languages

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 8

SUBJECT Data Base Interrogation/Searching

TOPIC Searching Methods

TIME 1 hour

MAJOR OBJECTIVE(S):

Introduction to the system and simple search techniques.

SPECIFIC OBJECTIVES:

1. Logging in.
2. Basic selection constructs
3. Relational expressions

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Logging in instruction.
3. Homework 1.

RECOMMENDED READINGS:

Information Retrieval Systems by F. W. Lancaster (chapter 11).
NASA/RECON SYSTEM user manual (chapters 1, 2 and 3)

OUTSTANDING ASSIGNMENTS: Homework 1

1. Homework 1

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion
3. Receiving logon id
4. Receiving homework 1.

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Assigning logon IDs or giving instruction on how to get them.
3. Assigning homework 1, due at class 11.

SUMMARY OF LESSON:

Lesson demonstrates different methods of interrogating a data base.

FOCAL POINTS (test areas):

1. logging in
2. comparison of different searches
3. relational expression

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 9

SUBJECT Data Base Interrogation/Searching

TOPIC String Matching and Data Base Searching Languages

TIME 1 hour

MAJOR OBJECTIVE(S): An overview of the different searching techniques.

SPECIFIC OBJECTIVES:

1. String matching .
2. Existence check.
3. Logical Combinations.

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Terminal.
3. Usage assignment I.
4. NASA/RECON SYSTEM user's manual.

RECOMMENDED READINGS:

NASA RECON User's Manual

OUTSTANDING ASSIGNMENTS: Homework 1; Usage 1

1. Usage assignment I

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking.
2. Questions about homework 1.
3. Receiving usage assignment I.
4. Getting introduced to the terminal.

--INSTRUCTOR ORIENTED--

1. Foil presentation.
2. Demonstration of log-on procedures.
3. Assigning Usage assignment I, due at class 12.
4. Answer questions about homework 1.

SUMMARY OF LESSON:

Lesson will present boolean logic and data base searching languages. It will introduce the RECON system along with a demonstration of the system.

FOCAL POINTS (test areas):

1. Searching Languages
2. Logical combinations

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 10

SUBJECT Data Base Report Generation

TOPIC Data Base Report Generation

TIME 1 hour

MAJOR OBJECTIVE(S): To know about the Report Generation Capabilities of information storage and retrieval systems.

SPECIFIC OBJECTIVES:

1. The learner will understand default report format.
2. The learner will understand fields of a report format.
3. The learner will understand user created formats.

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. NASA/RECON user's manual

RECOMMENDED READINGS:

Analysis and Design of Information Systems by James A. Senn.

The Analysis, design and Implementation of Information Systems by
Henry C. Lucas, Jr.

Database Management by the Editorial Staff of Auerbach Inc.

OUTSTANDING ASSIGNMENTS: Homework 1; Usage 1

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-Taking.
2. Questions about assignments.
3. Discussion .

--INSTRUCTOR ORIENTED--

1. Foil presentation.
2. Answering of questions.

SUMMARY OF LESSON:

The lesson will carry the student from performing a search to
presenting him with different methods of output.

FOCAL POINTS (test areas):

1. User defined report format.
2. System default report format.

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 11

SUBJECT Data Base Update

TOPIC Date Base Update

TIME 1 hour

MAJOR OBJECTIVE(S): To introduce the students to the process of
data base update and access controls.

SPECIFIC OBJECTIVES:

1. The learner will recognize the factors related to data base update.
2. The learner will understand the details of update access control.

RESOURCE MATERIALS NEEDED:

1. Visuals.

RECOMMENDED READINGS:

Computer Data-Base Organization by James Martin (1975).

OUTSTANDING ASSIGNMENTS: Homework 1 (due); Usage 1

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion
3. Turn in homework 1.

--INSTRUCTOR ORIENTED--

1. Foil presentation.
2. Pick up homework 1.

SUMMARY OF LESSON:

Lesson will introduce data base updating operations and procedures.

FOCAL POINTS (test areas):

1. Update operation
2. Update access control

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 12

SUBJECT Data Base Redefinition and Administrative Functions

TOPIC Data Base Redefinition and Administrative Functions

TIME 1 hour

MAJOR OBJECTIVE(S): To introduce the students to the process of data base redefinition. To inform the student about the responsibilities of the system administrator and the data base administrator.

SPECIFIC OBJECTIVES:

1. The learner will understand the reasons and justifications for data base redefinition.
2. The learner will see examples of redefinition languages.
3. The learner will understand the system administrator's functions.
4. The learner will understand the data base administrator's functions.

RESOURCE MATERIALS NEEDED:

1. Visuals.

RECOMMENDED READINGS:

The Analysis, Design and Implementation of Information Systems by
Henry C. Lucas, Jr.

Analysis and Design of Information Systems by J. A. Senn.

OUTSTANDING ASSIGNMENTS: Usage 1 (due)

ACTIVITIES:

--STUDENT ORIENTED--

1. Note_taking.
2. Discussion.
3. Turn in Usage assignment I.

--INSTRUCTOR ORIENTED--

1. Foil presentation.
2. Pick up Usage assignment I.

SUMMARY OF LESSON:

The lesson discusses and justifies data base redefinition, it also takes a close look at the functions of the system administrator and the data base administrator.

FOCAL POINTS (test areas):

1. Need for data base redefinition.
2. Data base redefinition Languages.
3. Functions of the system administrator.
4. Functions of the data base administrator.

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 13

SUBJECT Data Base Security

TOPIC Physical Protection, Authentication, and Authorization

TIME 1 hour

MAJOR OBJECTIVE(S): To identify some data base security considerations and make a survey of the technologies currently in use.

SPECIFIC OBJECTIVES:

1. The learner will recognize some technologies currently used in data base security.
2. The learner will understand how authentication and authorization operate in a data base system.

RESOURCE MATERIALS NEEDED:

1. Visuals.

RECOMMENDED READINGS:

The Analysis, Design and Implementation of Information Systems by
Henry C. Lucas, Jr.

Principles of Data-Base Management by James Martin.

OUTSTANDING ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion

--INSTRUCTOR ORIENTED--

1. Foil presentation.

SUMMARY OF LESSON:

Lesson presents the different methods utilized by data base
systems for security.

FOCAL POINTS (test areas):

1. Definition of authorization.
2. Methods of authorization.
3. Definition of authentication.
4. Methods of authentication.
5. Physical protection techniques.

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 14

SUBJECT Data Base Security

TOPIC Security Logging and Security/Privacy Transformations

TIME 1 hour

MAJOR OBJECTIVE(S): To identify some data base security considerations and survey the technologies currently in use.

SPECIFIC OBJECTIVES:

1. The learner will recognize some technologies currently used in data base security.
2. The learner will understand security logging and security/privacy transformations.

RESOURCE MATERIALS NEEDED:

1. Visuals.

RECOMMENDED READINGS:

The Analysis, Design and Implementation of Information Systems by
Henry C. Lucas, Jr.

Principles of Data-Base Management by James Martin.

OUTSTANDING ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking.
2. Discussion.

--INSTRUCTOR ORIENTED--

1. Foil presentation.

SUMMARY OF LESSON:

The lesson completes the investigation of security problems in
data base systems and the technology currently in use to remedy
these problems.

FOCAL POINTS (test areas):

1. Different techniques used for data base security.

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 15

SUBJECT Performance Measurement and Evaluation

TOPIC Performance Measurement and Evaluation

TIME 1 hour

MAJOR OBJECTIVE(S): To introduce basic concepts and issues related to evaluating IS & R system.

SPECIFIC OBJECTIVES:

1. The learner will understand the basic concepts of evaluating IS&R systems.
2. The learner will learn which issues will affect the performance of a IS&R system.
3. The learner will be exposed to tools used to evaluate IS&R systems.

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Handout, MADAM questionnaires

RECOMMENDED READINGS:

Information Retrieval System (chapter 14) by F. W. Lancaster.

Analysis and Design of Information System by J. A. Senn.

The Analysis, Design, and Implementation of Information Systems
by Henry C. Lucas.

OUTSTANDING ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking.
2. Discussion.

--INSTRUCTOR ORIENTED--

1. Foil presentation.
2. Over view of examination.

SUMMARY OF LESSON:

Lesson is a brief introduction to performance measurement and evaluation which will be discussed in greater detail later.

FOCAL POINTS (test areas):

1. Tools and techniques used in performance measurement and evaluation.

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 16

SUBJECT **** TEST ****

TOPIC User Categorizations through Performance Measurement & Evaluation

TIME 1 hour

MAJOR OBJECTIVE(S): To measure the student's grasp of the analysis of features of an IS&R system.

SPECIFIC OBJECTIVES:

1. To measure understanding of user categorizations
2. To measure understanding of Data Models
3. To measure understanding of Logical Data Structures
4. To measure understanding of Physical Storage Structures
5. To measure understanding of the concepts of Data Base Definition, Data Base Interrogation, Data Base Report Generation, Data Base Update and Redefinition
6. To measure understanding of the concepts of Data Base Definition and Redefinition, Data Base Interrogation, Data Base Update, and Report Generation.

RESOURCE MATERIALS NEEDED:

1. Prepared Test 1

RECOMMENDED READINGS:

Class foils for lessons 1 - 15

HOMEWORK ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Written test

--INSTRUCTOR ORIENTED--

1. Administer test

SUMMARY OF LESSON:

(Not Applicable)

FOCAL POINTS (test areas):

1. (Not Applicable)

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 17

SUBJECT Bibliographic Data Base Design

TOPIC Bibliographic Data Base Level and File Design

TIME 1 hour

MAJOR OBJECTIVE(S): Introduction to the bibliographic data base hierarchy.

SPECIFIC OBJECTIVES:

1. The learner will understand the hierarchy of bibliographic data base design.
2. The learner will be exposed to file design considerations for a bibliographic data base.

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Homework 2.

RECOMMENDED READINGS:

OUTSTANDING ASSIGNMENTS: Homework 2

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking.
2. Discussion
3. Receive homework 2.

--INSTRUCTOR ORIENTED--

1. Foil presentation.
2. Assign homework 2 (due at class 20)

SUMMARY OF LESSON:

Lesson turns its attention to a special type of data base called bibliographic data base. It discusses the different levels and basic features of this type.

FOCAL POINTS (test areas):

1. Bibliographic data base levels.
2. Bibilographic data base file types and their functions.

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 18

SUBJECT Bibliographic Data Base Design

TOPIC Bibliographic Data Base Files

TIME 1 hour

MAJOR OBJECTIVE(S): An overview of the types of files used by a bibliographic data base.

SPECIFIC OBJECTIVES:

1. The learner will understand the the purpose of the different files used in a bibliographic data base.
2. Learner will be made aware of document file design considerations.

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Usage assignment II.
3. Handouts showing EXPAND, COMBINE, SELECT, SET STATUS.

RECOMMENDED READINGS:

Database Design (1977) by G. Wiederhold.

OUTSTANDING ASSIGNMENTS: Homework 2; Usage II

Usage assignment II.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion
3. Receive usage assignment II.
4. Questions about homework 2.

--INSTRUCTOR ORIENTED--

1. Foil Presentation
2. Distribution of Usage assignment II. (Due at class 22).
3. Answering questions from homework 2.
4. Distribution of handout for Usage assignment II.

SUMMARY OF LESSON:

Lesson looks at the different types of files used by the bibliographic data base.

FOCAL POINTS (test areas):

1. Types of files in a bibliographic data base.
2. Levels of data base organization.
3. Data types.

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 19

SUBJECT Bibliographic file structures

TOPIC Linear, Indexed, and List Structured File Organizations

TIME 1 hour

MAJOR OBJECTIVE(S): To give a more detailed introduction of bibliographic file structures in addition to the physical storage structure.

SPECIFIC OBJECTIVES:

1. The learner will understand the basic concepts of linear file organizations.
2. The learner will understand the basic concepts of indexed file organizations.
3. The learner will understand the basic concepts of list structured files. organizations.

RESOURCE MATERIALS NEEDED:

1. Visuals.

RECOMMENDED READINGS:

Information Retrieval Systems (chapter 13) by F. W. Lancaster.

OUTSTANDING ASSIGNMENTS: Homework 2; Usage II

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion
3. Questions about assignments

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Answer questions about assignments.

SUMMARY OF LESSON:

Lesson takes a closer look at the files of a bibliographic data base and discusses the organizations of the different types of files.

FOCAL POINTS (test areas):

1. Linear file.
2. Indexed file organizations.
3. List structured file organizations.

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 20

SUBJECT Bibliographic file structures

TOPIC Tree, Network and Clustered File Organizations

TIME 1 hour

MAJOR OBJECTIVE(S): To give a more detailed introduction of bibliographic file structures in addition to the physical storage structure.

SPECIFIC OBJECTIVES:

1. The learner will understand the basic concepts of tree and network file organizations.
2. The learner will understand the basic concepts of clustered file organizations.

RESOURCE MATERIALS NEEDED:

1. Visuals.

RECOMMENDED READINGS:

Information Retrieval Systems (chapter 13) by F. W. Lancaster.

OUTSTANDING ASSIGNMENTS: Homework 2 (due); Usage II

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion
3. Turn in homework 2.

--INSTRUCTOR ORIENTED--

1. Foil presentation.
2. Pick up homework 2.

SUMMARY OF LESSON:

Lesson completes the discussion of bibliographic files and organizations.

FOCAL POINTS (test areas):

1. Tree, network and clustered file organizations.
2. Tradeoffs of various file organizations.

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 21

SUBJECT Vocabulary Control

TOPIC Controlled Vocabularies

TIME 1 hour

MAJOR OBJECTIVE(S): To introduce the concept of controlled vocabularies and present the differences between indexing and searching of systems which employ controlled vocabularies and those which do not.

SPECIFIC OBJECTIVES:

1. To recognize the advantages and disadvantages of a controlled vocabulary in searching a data base
2. To understand that a concept may be embedded in several terms.
3. To understand that not all terms are postable in a controlled vocabulary system.

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Access to NASA RECON terminals
3. NASA RECON User's Manual

RECOMMENDED READINGS:

Vocabulary Control for Information Retrieval by F. W. Lancaster

NASA RECON User's Manual

OUTSTANDING ASSIGNMENTS: Usage II

ACTIVITIES:

--STUDENT ORIENTED--

1. Review of User's Manual

--INSTRUCTOR ORIENTED--

1. Foil presentation

SUMMARY OF LESSON:

Lesson teaches the basic concept of the controlled vocabulary as an influence in indexing and searching.

FOCAL POINTS (test areas):

1. Controlled vocabularies
2. Advantages and disadvantages of the controlled vocabulary
3. Compound concepts

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 22

SUBJECT Vocabulary Control

TOPIC Free Text Approaches

TIME 1 hour

MAJOR OBJECTIVE(S): To identify the concept of free text indexing/searching in relation to IS&R

SPECIFIC OBJECTIVES:

1. To recognize the advantages and disadvantages of free text searching.
2. To understand the differences between controlled vocabulary index/search techniques and free text index/search techniques

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Access to NASA RECON terminals
3. Handouts
4. NASA RECON User's Manual

RECOMMENDED READINGS:

Vocabulary Control for Information Retrieval by F. W. Lancaster

NASA RECON User's Manual

OUTSTANDING ASSIGNMENTS: Usage II (due).

ACTIVITIES:

--STUDENT ORIENTED--

1. Discussion.
2. Note-taking
3. Turn in Usage assignment II

--INSTRUCTOR ORIENTED--

1. Foil Presentation
2. Explanation of handouts
3. Demonstration of search procedures
4. Pick up Usage assignment II

SUMMARY OF LESSON:

Lesson demonstrates the problems encountered in searching records which have no index-search list. Advantages and disadvantages are discussed.

FOCAL POINTS (test areas):

1. Free text searches

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 23

SUBJECT Vocabulary Control

TOPIC Thesaurus Support

TIME 1 hour

MAJOR OBJECTIVE(S): To identify the concept of a thesaurus in relation to IS&R. To learn basic (bound and online) procedures in vocabulary control. To understand the advantages of a thesaurus.

SPECIFIC OBJECTIVES:

1. To understand the basic concepts of the thesaurus
2. To demonstrate an ability to use synonyms in searching .
3. To recognize the relationship between the Roget thesaurus and IS&R descriptors
4. To understand how to find and use postable terms

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Access to NASA RECON terminals
3. Handouts
4. NASA RECON User's Manual

RECOMMENDED READINGS:

Vocabulary Control for Information Retrieval by F. W. Lancaster

NASA RECON User's Manual

OUTSTANDING ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Review of Roget thesaurus
2. Note-taking
3. Hands-on experience using thesaurus for searching
4. Demonstration of ability to find related words in searching

--INSTRUCTOR ORIENTED--

1. Foil Presentation
2. Explanation of handouts (postable terms)
3. Demonstration of searches
4. Monitoring of terminal activities

SUMMARY OF LESSON:

Lesson describes the purpose and the use of subject headings and postable terms in searching. Reiterates the importance of synonym referencing.

FOCAL POINTS (test areas):

1. Identification of postable terms
2. Identification of descriptors

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 24

SUBJECT Vocabulary Control

TOPIC Thesaurus Utilization

TIME 1 hour

MAJOR OBJECTIVE(S): To identify the concept of a thesaurus in relation to IS&R systems To learn some basic (bound and online) procedures in vocabulary control

SPECIFIC OBJECTIVES:

1. To learn to utilize synonyms in searching
2. To learn to use the thesaurus to check misspellings and abbreviations
3. To use the thesaurus for identifying homographs
4. To demonstrate understanding of search enlargement
5. To demonstrate understanding of search confinement

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Access to NASA RECON terminals
3. Handouts

RECOMMENDED READINGS:

Vocabulary Control for Information Retrieval by F. W. Lancaster

NASA User's Manual

OUTSTANDING ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Discussion of concepts
2. Note-taking

--INSTRUCTOR ORIENTED--

1. Presentation of foils
2. Explanation of handouts
3. Demonstration of search expansion and confinement

SUMMARY OF LESSON:

Lesson teaches the usage of expansion and confinement in facilitating searches.

FOCAL POINTS (test areas):

1. Use of EXPAND
2. Use of confinement
3. Related terms usage

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 25

SUBJECT Bibliographic Data Base Searching

TOPIC Types/Levels of Search Languages

TIME 1 hour

MAJOR OBJECTIVE(S): To identify the various types and levels of search languages. To relate the use of search languages and bibliographic data base searching

SPECIFIC OBJECTIVES:

1. To explain the content and dynamics of bibliographic IS&R systems
2. To present the rationale for hierarchy of search languages
3. To determine user needs in relation to search languages

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Handouts on types of search languages

RECOMMENDED READINGS:

"Information Retrieval" in Database Design (2nd Edition) by G. Wiederhold

Data Base User Languages for the Non-Programmer, pp. 183 - 212,
by P. C. Lockemann

Human Interaction With Computers by H. T. Smith and T. R. G. Green

Introduction to Modern Information Retrieval by G. Salton and M. J. McGill

Design of Man-Computer Dialogues by J. Martin

OUTSTANDING ASSIGNMENTS: None

ACTIVITIES:

--STUDENT ORIENTED--

1. Discussion of need for various levels of languages
2. Note-taking
3. Identification of user needs

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Lecture on brief review of IS&R system languages
3. Explanation of how to identify user needs

SUMMARY OF LESSON:

Lesson establishes the foundation of search language concepts in IS&R systems. Serves as lead-in to types of search languages and identification of user needs.

FOCAL POINTS (test areas):

1. Rationale for hierarchy of search languages
2. Dynamics of search languages

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 26

SUBJECT Bibliographic Data Base Searching

TOPIC Search Languages

TIME 1 hour

MAJOR OBJECTIVE(S): To differentiate between the various types of search languages and to demonstrate integrated combinations of these languages

SPECIFIC OBJECTIVES:

1. To explain the characteristics of Procedural, Host-Based Languages
2. To explain the characteristics of Self-contained query languages
3. To explain the characteristics of Prompting and Form Oriented languages
4. To explain the characteristics of menu-selection languages
5. To explain the characteristics and usages of natural languages

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Handouts on languages

RECOMMENDED READINGS:

"Information Retrieval" in Database Design (2nd Edition), pp. 521-542, by G. Wiederhold.

Data Base User Languages for the Non-Programmer, pp. 183-212, by P. C. Lockermann

Human Interaction with Computers by H. T. Smith and T. R. G. Green

Introduction to Modern Information Retrieval by G. Salton and M. J. McGill

Design of Man-Computer Dialogues by J. Martin

OUTSTANDING ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion of search language types

--INSTRUCTOR ORIENTED--

1. Presentation of foils
2. Explanation of handouts
3. Discussion of search language types

SUMMARY OF LESSON:

Lesson presents the various search languages available on IS&R systems and the characteristics of each.

FOCAL POINTS (test areas):

1. Differences in search languages

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 27

SUBJECT Search and Formulation Features

TOPIC Search Field Control

TIME 1 hour

MAJOR OBJECTIVE(S): To enable students to conduct online searches

SPECIFIC OBJECTIVES:

1. To implement available commands in conducting a search
2. To understand the relationship between the command and the entry recovered
3. To understand the use of Boolean expressions
4. To demonstrate how to combine commands for search expressions

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Handouts of examples
3. NASA RECON User's Manual (or excerpts)

RECOMMENDED READINGS:

Introduction to Modern Information Retrieval by G. Salton & McGill.

NASA RECON User's Manual

OUTSTANDING ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion of Boolean concepts
3. Hands-on experiences in conducting searches

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Explanation of handouts
3. Demonstration of Text and Non-text fields
4. Monitoring of terminal activities

SUMMARY OF LESSON:

Lesson demonstrates text and non-text field control in searches

FOCAL POINTS (test areas):

1. Title, Series title, Abstract, Subject heading, Publisher, and Conference searches
2. Differences between text and non-text fields

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 28

SUBJECT Search Formulation Features

TOPIC Phrase and Term Searching

TIME 1 hour

MAJOR OBJECTIVE(S): To introduce students to additional search techniques.

SPECIFIC OBJECTIVES:

1. To implement available commands in conducting a search
2. To understand the relationship between the command and the entry
3. To understand the use of Boolean expressions
4. To understand the concepts of phrase searches in natural and inverted order

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Handouts.
3. Access to NASA RECON terminals
4. Usage Assignment III

RECOMMENDED READINGS:

Introduction to Modern Information Retrieval by G. Salton

NASA RECON User's Manual

OUTSTANDING ASSIGNMENTS: Usage Assignment III

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Receive Usage Assignment III

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--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Explanation of handouts
3. Demonstration of phrase and term searches
4. Distribute Usage assignment III(due at class 32)

SUMMARY OF LESSON:

Lesson teaches basic concepts of term and phrase searches.
Proximity and range searches are introduced.

FOCAL POINTS (test areas):

1. Understanding of phrase search concepts

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 29

SUBJECT Search Formulation Features

TOPIC Root and Sub-string Searches

TIME 1 hour

MAJOR OBJECTIVE(S): To enable students to conduct online searches

SPECIFIC OBJECTIVES:

1. To implement available commands in conducting a search
2. To understand the concepts of root and sub-string searches
3. To understand the relationship between the command and the returned information
4. To understand the concept of combining commands for search expressions

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Handouts
3. Access to NASA RECON terminals
4. NASA RECON User's Manual

RECOMMENDED READINGS:

Introduction to Modern Information Retrieval by G. Salton

NASA RECON User's Manual

OUTSTANDING ASSIGNMENTS: Usage Assignment III

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion of concepts
3. Hands-on experience with terminals

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Explanation of handouts
3. Demonstration of root and sub-string searches
4. Monitoring of terminal activities

SUMMARY OF LESSON:

Lesson teaches the important search concepts of root and sub-string commands, how they are used, and what results they will produce.

FOCAL POINTS (test areas):

1. How to conduct root searches
2. How to conduct substring searches
3. Relation between command and retrieved information

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 30

SUBJECT Search Formulation Features

TOPIC Dictionary Searches and Thesaurus Searches

TIME 1 hour

MAJOR OBJECTIVE(S): To enable the students discover word meanings
by conducting online searches.

SPECIFIC OBJECTIVES:

1. To implement available commands in conducting a search
2. To understand the relationship between commands and the retrieved entry
3. To understand the concept of dictionary searches
4. To combine commands for search expression

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Handouts
3. Access to NASA RECON terminals
4. NASA User's Manual (or excerpts)

RECOMMENDED READINGS:

Introduction to Modern Information Retrieval by G. Salton

NASA RECON User's Manual

OUTSTANDING ASSIGNMENTS: Usage Assignment III

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion of concepts

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Demonstration of dictionary searches
3. Explanation of handouts

SUMMARY OF LESSON:

Lesson teaches the important concepts of dictionary searches.

FOCAL POINTS (test areas):

1. How to conduct dictionary searches
2. Relationship between command and retrieved information
3. Use of the thesaurus

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 31

SUBJECT Search Formulation Features

TOPIC Thesaurus Searching, Relational Operation, Search Profiles

TIME 1 hour

MAJOR OBJECTIVE(S): To enable the students to conduct online searches

SPECIFIC OBJECTIVES:

1. To understand and utilize the thesaurus facilities in IS&R
2. To understand and utilize Boolean operators in queries
3. To understand the concept of search profiles
4. To understand the concept of search strategies

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. NASA User's Manual
3. Handouts
4. Access to NASA RECON terminals

RECOMMENDED READINGS:

Introduction to Modern Information Retrieval by G. Salton

NASA User's Manual

OUTSTANDING ASSIGNMENTS: Usage Assignment III.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Hands-on experiences with terminals
3. Creative query construction
4. Boolean exercises and problems
5. Discussion of concepts

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Explanation of handouts
3. Demonstration of thesaurus searches, Boolean usage, and search profile
4. Demonstration of concept of Boolean usage in conjunction with exercises
5. Monitoring of terminal activities

SUMMARY OF LESSON:

Lesson teaches important principles of searching using thesauri, Boolean expressions, and search profiles.

FOCAL POINTS (test areas):

1. Use of Boolean expressions
2. Use of the thesaurus in searches
3. Use of the search profile

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 32

SUBJECT Search Formulation Features

TOPIC Request Sets, Search Review

TIME 1 hour

MAJOR OBJECTIVE(S): To enable students to conduct online searches

SPECIFIC OBJECTIVES:

1. To introduce the concept of search sets and request sets
2. To introduce the concept of search review
3. To explain the value of search reviews - current status, summary, etc.

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Access to NASA RECON terminals
3. Handouts
4. NASA User's Manual (or excerpts)

RECOMMENDED READINGS:

Introduction to Modern Information Retrieval by G. Salton

NASA User's Manual

OUTSTANDING ASSIGNMENTS: Usage Assignment III.

1. Usage assignment IV.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion of concepts
3. Hands-on experiences with terminals
4. Turn in Usage Assignment III.

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Explanation of handouts
3. Demonstration of searches and use of sets
4. Monitoring of terminal activities
5. Pick up Usage Assignment III

SUMMARY OF LESSON:

Lesson shows the value of sets and search review facilities of
IS&R

FOCAL POINTS (test areas):

1. Usage of sets
2. Search review concepts
3. Available session information and its usage
4. Saved search strategies

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 33

SUBJECT **** TEST ****

TOPIC Bibliographic Data Base Design through Search
Formulation Features

TIME 1 hour

MAJOR OBJECTIVE(S): To measure the student's understanding of
search commands and their usage in IS&R

SPECIFIC OBJECTIVES:

1. To measure student's understanding of Bibliographic Data Base Designs and File structures
2. To measure understanding of the concepts of Vocabulary Control
3. To measure understanding of the concepts of data base searching
4. To measure understanding of Search Formulation Features
5. To measure understanding of commands and their usage
6. To measure understanding of the relationship between commands and the retrieved information

RESOURCE MATERIALS NEEDED:

1. Prepared Test2

RECOMMENDED READINGS:

(Notes from class nos. 17 thru 32)

HOMEWORK ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Testing

--INSTRUCTOR ORIENTED--

1. Administration of Test2

SUMMARY OF LESSON:

Not Applicable

FOCAL POINTS (test areas):

Not Applicable

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 34

SUBJECT Output Generation Features

TOPIC Search Review, Online vs Offline, Pre-defined & User Defined Output Formats

TIME 1 hour

MAJOR OBJECTIVE(S): To explain the concept and facilities of output in IS&R systems

SPECIFIC OBJECTIVES:

1. To explain the difference between online and offline generation
2. To show pre-defined output formats
3. To show user-defined output formats
4. To introduce the concept of printed index generation (lead-in for class 35)

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Usage Assignment IV

RECOMMENDED READINGS:

Any IS&R user's manual on Output Generation Features

HOMEWORK ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion
3. Receive Usage IV

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Discussion of examples
3. Distribute Usage Assignment IV (due at class 38)

SUMMARY OF LESSON:

Lesson presents the alternatives available for output formats in IS&R systems

FOCAL POINTS (test areas):

1. Value of user-defined output
2. Value of pre-defined output
3. Explanation of online vs offline generation
4. Explanation of KWIC and KWOC entries (printed Index generation)

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 35

SUBJECT Output Generation

TOPIC Additional Output Features and Printed Index Generation

TIME 1 hour

MAJOR OBJECTIVE(S): To explain the output facilities available on
IS&R.

SPECIFIC OBJECTIVES:

1. To explain rapid scan, expanding, highlighting, sorting, and ranking procedures
2. To explain index generation (KWIC and KWOC)

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. NASA RECON User's Manual
3. Handouts of index output

RECOMMENDED READINGS:

NASA User's Manual

Information Retrieval System (Chap. 14) by F. W. Lancaster

Data Base Management by Averbach

OUTSTANDING ASSIGNMENTS: Usage Assignment IV.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Explanation of handouts
3. Explanation of instructional features

SUMMARY OF LESSON:

Lesson summarizes the output generation features of IS&R.

FOCAL POINTS (test areas):

1. Index generation (KWIC and KWOC)
2. Additional features of output generation
3. Use of user guides in diagnosing problems

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 36

SUBJECT Instructional and Diagnostic Features

TOPIC User's guides, Online usage, live help, error facilities

TIME 1 hour

MAJOR OBJECTIVE(S): To demonstrate the facilities available for instructional and diagnostic purposes in IS&R systems

SPECIFIC OBJECTIVES:

1. To understand the concept of online documentation
2. To understand the concept of online training
3. To understand the need for the availability of live help
4. To understand the use of error diagnostic facilities
5. To understand the use of sample searches
6. To understand the use of user's guides

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Access to IS&R system

RECOMMENDED READINGS:

Any IS&R manual

Information Retrieval System (Chap. 14) by F.W. Lancaster

Data Base Management by Averbach

Analysis & Design of Information Systems by J.A. Senn

The Analysis, Design, and Implementation of Information Systems
by Henry C. Lucas

OUTSTANDING ASSIGNMENTS: Usage Assignment IV

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion of instructional and diagnostic features
3. Hands-on experiences with an IS&R system

--INSTRUCTOR ORIENTED--

1. Presentation of foils
2. Discussion of features
3. Monitoring of terminal activities

SUMMARY OF LESSON:

Lesson presents the facilities available in IS&R systems for instruction of users and diagnosis of problems.

FOCAL POINTS (test areas):

1. Types of instructional facilities
2. Use of diagnostic facilities
3. Use of user's guides in diagnosing problems

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 37

SUBJECT Additional IS&R Application Areas

TOPIC Selective Dissemination of Information/ Personal Files

TIME 1 hour

MAJOR OBJECTIVE(S): To introduce the students to the concept of
SDI and personal data bases.

SPECIFIC OBJECTIVES:

1. To understand the concepts of SDI
2. To understand the concept of personal data bases

RESOURCE MATERIALS NEEDED:

1. Visuals.

RECOMMENDED READINGS:

Information Retrieval On-Line by Lancaster & Fayen (Chaps. 14, 16)

Personalized Data Base Systems by Benjamin Gittman and Lorraine Borman

OUTSTANDING ASSIGNMENTS: Usage Assignment IV.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Lecture

SUMMARY OF LESSON:

Lesson introduces concept of SDI and current awareness systems and personal data bases.

FOCAL POINTS (test areas):

1. Concept of SDI
2. Concept of personal data bases

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 38

SUBJECT Additional IS&R Application Areas

TOPIC Interfaces with Document Delivery Systems, Combined Retrieval Systems, and Personal Computing Systems

TIME 1 hour

MAJOR OBJECTIVES(S): To acquaint the student with specialized applications of IS&R systems

SPECIFIC OBJECTIVES:

1. To understand the concept of combined retrieval systems
2. To understand the value of document retrieval interfaces
3. To appreciate the possibilities of personal computing environments

RESOURCE MATERIALS NEEDED:

1. Visuals.

RECOMMENDED READINGS:

Personalized Data Base Systems by Benjamin Gittman and Lorraine Borman

Information Retrieval On-Line by Lancaster & Fayen (Chaps. 14,16)

OUTSTANDING ASSIGNMENTS: Usage Assignment IV.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion
3. Turn in Usage Assignment IV

---INSTRUCTOR ORIENTED---

1. Foil presentation
2. Lecture
3. Pick up Usage Assignment IV

SUMMARY OF LESSON:

Lesson reiterates the value of document delivery systems and interfaces. It introduces the concept of combined retrieval and personal computing systems.

FOCAL POINTS (test areas):

1. SDI systems
2. Document delivery systems (value and usage)
3. Personal computing

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 39

SUBJECT Phases of the PME Life Cycle

TOPIC Phases/ Categorizations/ Parameters

TIME 1 hour

MAJOR OBJECTIVE(S): To understand the various phases involved in a
PME evaluation study of an IS&R system

SPECIFIC OBJECTIVES:

1. To understand various phases involved in a PME evaluation study
2. To understand the idea of a hierarchical evaluation and its value
3. To understand and recognize the various parameters which can be used to evaluate IS&R

RESOURCE MATERIALS NEEDED:

1. Visuals.

RECOMMENDED READINGS:

Any of James Martin's books

Information Retrieval System (Chap. 14) by F. W. Lancaster

Data Base Management by Averbach

Analysis & Design of Information Systems by J. A. Senn

The Analysis, Design, & Implementation of Information Systems by
Henry C. Lucas

OUTSTANDING ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion

--INSTRUCTOR ORIENTED--

1. Foil presentation

SUMMARY OF LESSON:

Lesson looks at the PME life cycle and how it is evaluated.

FOCAL POINTS (test areas):

1. Phases of the PME life cycle
2. Identification of parameters for evaluation

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 40

SUBJECT Phases of the PME Life Cycle

TOPIC Evaluation tools/ Experimentation/ Evaluation

TIME 1 hour

MAJOR OBJECTIVE(S): To understand the various phases involved in a
PME evaluation study of an IS&R system

SPECIFIC OBJECTIVES:

1. To understand the techniques used in evaluating an IS&R system
2. To understand the concept of cost/benefit analysis

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Handouts
3. Usage Assignment V

RECOMMENDED READINGS:

Any book by James Martin

Information Retrieval Systems (Chap. 14) by F. W. Lancaster

Data Base Management by Averbach

Analysis & Design of Information Systems by J. A. Senn

The Analysis, Design, & Implementation of Information Systems by
Henry C. Lucas

OUTSTANDING ASSIGNMENTS:

1. Usage Assignment V

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion
3. Receive Usage Assignment V

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Explanation of handouts
3. Distribute Usage Assignment V (due at class 44)

SUMMARY OF LESSON:

Lesson looks at the various techniques used in evaluating IS&R systems and the reasons for using cost/benefit analysis.

FOCAL POINTS (test areas):

1. Concept of cost/benefit analysis
2. Techniques in evaluating IS&R systems
- 5.

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 41

SUBJECT Traditional Obtrusive User Monitoring

TOPIC Concepts/ Experiments/ Subjective assessments

TIME 1 hour

MAJOR OBJECTIVE(S): To identify and define methods involving
obtrusive techniques to monitor user
interactions

SPECIFIC OBJECTIVES:

1. To define obtrusive monitoring
2. To understand the capabilities and limitations of obtrusive monitoring
3. To understand how information obtained is used in design and evaluation

RESOURCE MATERIALS NEEDED:

1. Visuals.

RECOMMENDED READINGS:

Information Retrieval Systems (Chaps. 9 - 12) by F. W. Lancaster

OUTSTANDING ASSIGNMENTS:

1. Usage Assignment V

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
3. Discussion

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Discussion of monitoring advantages and limitations

SUMMARY OF LESSON:

Lesson looks at obtrusive monitoring and its limitations in IS&R evaluation

FOCAL POINTS (test areas):

1. Types of obtrusive monitoring
2. Values and limitations of obtrusive monitoring

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 42

SUBJECT Traditional Obtrusive User Monitoring

TOPIC Recall & Precision Analysis/ Failure Analysis/ Coverage

TIME 1 hour

MAJOR OBJECTIVE(S): To identify and define methods involving obtrusive techniques to monitor user interactions.

SPECIFIC OBJECTIVES:

1. To understand the value of monitoring
2. To understand the use of results from such monitoring
3. To understand the concepts of Recall and Precision
4. To understand Failure Analysis

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Access to IS&R system
3. Homework 3

RECOMMENDED READINGS:

Information Retrieval Systems (Chaps. 9 - 12) by F. W. Lancaster

OUTSTANDING ASSIGNMENTS:

1. Homework 3
2. Usage Assignment V

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Receive Homework 3

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Discussion
3. Distribute Homework 3

SUMMARY OF LESSON:

Lesson looks at the information gained from obtrusive monitoring and how it is used

FOCAL POINTS (test areas):

1. Recall and Precision Analysis
2. Failure Analysis
3. Use of information gained through monitoring

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 43

SUBJECT Unobtrusive User Monitoring

TOPIC Concepts/Facilities/System Usage Profiles and analysis

TIME 1 hour

MAJOR OBJECTIVE(S): To define unobtrusive user monitoring and introduce methods used to obtain information.

SPECIFIC OBJECTIVES:

1. To define unobtrusive monitoring
2. To understand the capabilities and limitations of such monitoring
3. To understand how the information is used in evaluation and design
4. To obtain a basic understanding of how such systems are implemented

RESOURCE MATERIALS NEEDED:

1. Visuals.
2. Hands-on access to an IS&R system

RECOMMENDED READINGS:

Information Retrieval Systems (Chaps. 9 - 12) by F. W. Lancaster

OUTSTANDING ASSIGNMENTS:

1. Homework 3
2. Usage Assignment V

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Discussion of system

SUMMARY OF LESSON:

Lesson looks at unobtrusive monitoring and its limitations and uses.

FOCAL POINTS (test areas):

1. Definition of unobtrusive monitoring
2. Value of unobtrusive monitoring
3. Use of information gathered

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 44

SUBJECT Unobtrusive User Monitoring

TOPIC Timing Analysis/ Error Recovery Analysis/ Utilization
of Results

TIME 1 hour

MAJOR OBJECTIVE(S): To define unobtrusive user monitoring and
define methods used to obtain information.

SPECIFIC OBJECTIVES:

1. To understand what type of information can be obtained
2. To understand the value of such information to the user and designer
3. To understand the use of this information in system evaluation

RESOURCE MATERIALS NEEDED:

1. Visuals.

RECOMMENDED READINGS:

Information Retrieval Systems (Chaps. 9 - 12) by F. W. Lancaster

OUTSTANDING ASSIGNMENTS:

1. Homework 3.
2. Usage Assignment V

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion
3. Turns in Usage Assignment V

--INSTRUCTOR ORIENTED--

1. Foil presentation .
2. Demonstration of system
3. Picking Up Usage Assignment V

SUMMARY OF LESSON:

Lesson looks at the value of unobtrusive monitoring and the results obtained.

FOCAL POINTS (test areas):

1. Timing analysis
2. Error Recovery Analysis
3. Utilization of Results

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 45

SUBJECT Future IS&R Systems

TOPIC Languages for Retrieval

TIME 1 hour

MAJOR OBJECTIVE(S): To understand the various possible extensions to computer languages and the uses of these future languages.

SPECIFIC OBJECTIVES:

1. To understand the concept of common command languages.
2. To appreciate the possible applications of special character languages.
3. To understand the advantages of natural languages.

RESOURCE MATERIALS NEEDED:

1. Visuals.

RECOMMENDED READINGS:

Introduction to Modern Information Retrieval by G. Salton and M. J. McGill.

Design of Man-Computer Dialogues by J. Martin.

OUTSTANDING ASSIGNMENTS: Homework Assignment 3

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion

--INSTRUCTOR ORIENTED--

1. Foil presentation

SUMMARY OF LESSON:

The lesson looks at some possible future developments in languages for information retrieval.

FOCAL POINTS (test areas):

1. Applications of special character languages.
2. Advantages of natural languages.
3. Advantages of common command languages.

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 46

SUBJECT Future IS&R Systems

TOPIC Alternate User Interfaces and PC Environments

TIME 1 hour

MAJOR OBJECTIVE(S): To involve the student in speculation about possible new man-machine interfaces and the future applications of personal computers.

SPECIFIC OBJECTIVES:

1. To show the student the possibility of graphics interfaces, television interfaces, voice and text recognition, and other future techniques.
2. To understand the power and flexibility of personal computing environments.

RESOURCE MATERIALS NEEDED:

1. Visuals.

RECOMMENDED READINGS:

Introduction to Modern Information Retrieval by G. Salton and M. J. McGill

Human Interaction with Computers by H. T. Smith and T. R. Green.

OUTSTANDING ASSIGNMENTS: Homework Assignment 3

ACTIVITIES:

--STUDENT ORIENTED--

1. Note-taking
2. Discussion
3. Turn in homework assignment 3.

--INSTRUCTOR ORIENTED--

1. Foil presentation
2. Pick up Homework Assignment 3

SUMMARY OF LESSON:

The lesson presents a survey of user friendly man-computer dialogues of the future and some uses of personal computers.

FOCAL POINTS (test areas):

1. Experimental input and output devices.
2. Advantages of PC environments.

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 47

SUBJECT Future IS&R Systems

TOPIC Knowledge Based Systems and Distributed Systems

TIME 1 hour

MAJOR OBJECTIVE(S): To understand the basic concepts of Knowledge Based Systems and Distributed Computing Systems.

SPECIFIC OBJECTIVES:

1. The learner will appreciate some of the applications of Knowledge Based Systems.
2. The learner will understand some of the complexity of constructing a Knowledge Based System.
3. The learner will be exposed to the idea of computing networks.
4. The learner will understand some of the problems of distributed computing.

RESOURCE MATERIALS NEEDED:

1. Visuals.

PAGE MISSING FROM AVAILABLE VERSION

FOCAL POINTS (test areas):

1. Knowledge representation in KBS.
2. Configurations of networks.

INSTRUCTOR'S NOTES:

LESSON PLANS

CLASS NO. 48

SUBJECT FINAL EXAMINATION

TOPIC Cumulative topics 1 - 47

TIME 1 hour

MAJOR OBJECTIVE(S): To measure student's mastery of the concepts,
procedures, and operations of an IS&R system.

SPECIFIC OBJECTIVES:

1. Not Applicable

RESOURCE MATERIALS NEEDED:

1. Prepared Final Examination

RECOMMENDED READINGS:

Class notes NASA RECON User's Manual

OUTSTANDING ASSIGNMENTS: None.

ACTIVITIES:

--STUDENT ORIENTED--

1. Test taking

--INSTRUCTOR ORIENTED--

1. Administration of written test

SUMMARY OF LESSON:

Not Applicable

FOCAL POINTS (test areas):

1. All class notes

INSTRUCTOR'S NOTES:

ATTACHMENT 3.7

**COURSE DEVELOPMENT PHASE:
FIRST DRAFT OF PROPOSED
COURSE HOMEWORK ASSIGNMENTS
AND
ANSWER KEYS**

N A S A

N A S A

```
*****
*
*
*           N A S A   /   R E C O N
*
*   C O U R S E   D E V E L O P M E N T   S E R I E S
*
*
*           F I R S T   D R A F T :
*
*   P R O P O S E D   C O U R S E   H O M E W O R K   A S S I G N M E N T S
*
*           A N D   A N S W E R   K E Y S
*
*
*****
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The NASA/RECON Course Development Series contains a collection of draft course development deliverables representing draft results of the educational course development activities being conducted pursuant to the specifications of National Aeronautics and Space Administration Contract Number NASW-3846.

The entries within this series are in "draft" form; they represent work in progress and work in various stages of revision. As such, they should not be construed as final products nor should they be viewed as material for widespread distribution. All entries within this series will be subjected to multiple development phase revisions, to course pilot administration, and to final course pilot evaluation and final revision prior to being distributed as final course deliverables.

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C O U R S E

D E V E L O P M E N T

HOMEWORK I

NOTE TO INSTRUCTOR

Note:

The questions marked with two asterisks (i.e.: 11.4**) are somewhat difficult questions. They involve special knowledge, and the material required is not completely covered in the visuals. The instructor will have to make sure that his students are able to handle such questions.

The questions are numbered such as:

3.1

where the "3" in the number of the lesson, and "1" a sequential number (i.e.: the first question in lesson 3)

*
*
* HOMEWORK I *
*
*

INFORMATION RETRIEVAL USING COMPUTERS

- 3.1. Discuss the advantages and disadvantages of manual searching.

See Visuals (Lesson 3)

- 3.2. Discuss the advantages and disadvantages of online searching.

See Visuals (Lesson 3)

Some disadvantages:

The limited range of material in data bases (few before the early 70's, and rare in some fields).

Complexity of searching process and great variety of systems available.

The cost is sometimes seen as a disadvantage, also.

- 3.3. Compare an IS&R search with a DBMS search.

When searching in a DBMS, the user looks for an exact match (for example: SSN, sex, name)

In IS&R exact matches are not very frequent, and often impossible since the user searches for items (usually documents or abstracts) which pertain to the general subject defined by the search term.

- 3.4. Compare the data in an IS&R system, and in a DBMS.

In a DBMS, the data is structured and very often numeric. In an IS&R, the data is most of the time in natural language (full text of documents, abstracts...)

USER CATEGORIZATION

4.1. Discuss the reasons for user categorization.

See Visuals (Lesson 4)

4.2. Who has the primary responsibility of protecting the data base against unauthorized users?

The Data Base Administrator (DBA) has the primary responsibility for data base security.

4.3. If we define the "owner" of some data as the person responsible for granting and deleting access rights, as well as the person responsible for corrections and updates, who in the Data Base is the "owner" of the data?

Generally, in a DBMS each End User is the "owner" of his own data. In IS&R, however, the user can only retrieve information and only if access has been granted to him by the Data Base Administrator.

Note, that there exist many exceptions, where end users are not owners of the data, and where IS&R system end users own the data. But the general rule is still valid in most cases.

4.4. An end user is trying to update some information, but the system keeps sending nasty messages. What do you think could be the problem?

- 1) The end user may not be using the proper updating procedures.
- 2) He may not be authorized to update that information (that is, the information might be protected from update by the application programmer).

4.5. Contrast the function of the System Administrator and the Data Base Administrator.

The system administrator has authority over the whole system, while the data base administrator's responsibility is limited to one data base.

The DBA will suggest some changes to be made, since he knows his users' needs, but the System Administrator will be the one to decide if the changes are actually going to be made.

4.6. Describe the role of the Information Specialist.

The Information Specialist is a professional who will create and enter an online search for a person in need of information.

Because of the variety of systems available, and the differences between the data bases, an occasional user will often be left confused. In order to alleviate frustration and poor productivity resulting from users' lack of training, the Information Specialist has become a necessity.

DATA BASE MODELS

5.1. What is the difference between data stored in a data file and stored in a data base?

A file is a simple collection of data. The relation between the items are fixed when the data is created, and new relationships can not be created without changing the file structure.

A Data Base gives multiple views of the stored data. Each user has a view of the data corresponding to his own needs. The relationship is created dynamically as required by the user.

5.2. Define the following terms:

a/ Data Base

b/ Item

c/ Record

A Data Base is a collection of data, and the relation among the data.

An Item is the smallest logical unit of data in a data base.

A Record is a set of items stored as a unit.

5.3. Define a key.

A key is an entity used to identify a record.

5.4. What is a primary key?

In some cases, many keys can uniquely identify a record. One key has to be selected as the most significant. It is called the "primary key".

5.5. What are multiple keys?

Multiple keys refer to the situation in which many keys can be used to access a single record.

5.6. When consulting a linear list, how many items need to be consulted on the average, before accessing the desired one?

*** $[(N+1)/2]$ (--> or half the file)

5.7. Assume a data base with entities:

DEPARTMENT, DEAN, FACULTY, COURSE, STUDENT, OFFICE.

Give examples of one_to_one, one_to_many, many_to_many relationships.

one_to_one : DEPT <---> DEAN
 FACULTY <---> OFFICE

one_to_many : DEPT <---> COURSE
 DEPT <---> STUDENT
 DEPT <---> FACULTY

many_to_many : COURSE <---> STUDENT
 COURSE <---> FACULTY

NOTE: The relationship may differ depending upon the meaning of the relation. For example, DEPT <---> FACULTY may be a many_to_many relationship if some faculties are assigned simultaneously to more than one department.

5.8** Network or hierarchical models define the relationship between two entities explicitly by set type or owner/member link, but the relational model does not define the relationship between two entities. In a relational model, how can a user combine two relations? Give an example.

Common data item(s) must exist between two relations, in order to be able to combine them. For example:

DEPARTMENT: DEPT_NO, DEPT_NAME, DEPT_ADDR, DEPT_PHONE

STUDENT : STU_SSN, STU_NAME, DEPT_NO, STU_BIRTH

DEPT_NO(department number) is the common data item which is necessary in order to allow combination of the two relations.

5.9** In a hierarchical model, how can you implement a many_to_many relationship? Give an example for COURSE <<-->> STUDENT relation.

Design two owner-member relations.

i.e. R1 : owner--- COURSE
member-- STUDENT

R2 : owner--- STUDENT
member-- COURSE

- 5.10. If you were to design a data base to keep your mailing list, what entities would you use? What could be the data items included in these entities? Indicate what data types you would use.

Name:	Address:	Entities
Last name	House	---
First name	Street	
Middle name	City	\ Data
	State	/ Items
	Zip Code	

In most cases, data types should be alphanumeric.

- 5.11 Give a brief description to explain the relationships between hospital and doctor, room and patient, patient and patient number.

	m - m	
Hospital	<----->	doctor
	1 - m	
Room	<----->	patient
	1 - 1	
Patient	<----->	patient number

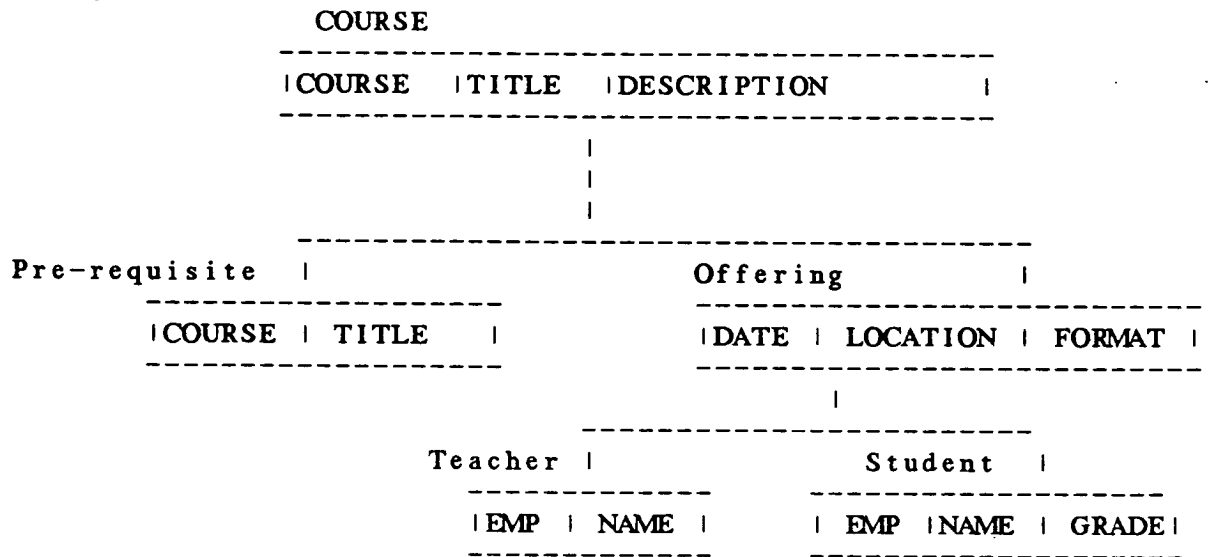
- 5.12 What is meant by data redundancy? How can it be eliminated? What kind of problem does data redundancy cause?

Storing data at more than one place creates data redundancy. Storing the relationship rather than storing duplicate data value will solve the problem. Data redundancy could create data non-consistency.

- 5.13 Assume there is an entirely data independent model. How will a user be affected if the way the data stored in memory is changed ?

No effect.

5.14 Given the diagram below, indicate which is the root record, nodes, and leaves ?



Root record : Course
 Nodes : Course, pre-requisite, offering, teacher, student
 Leaves : Pre-requisite, teacher, student

5.15 Given the following diagram, what is the tuple's primary key.

Part

p	p name	color	weight	city
p1	nut	red	12	London
p5	bolt	green	13	London
p2	nail	blue	10	Paris
p3	bolt	green	11	New York
p4	nail	yellow	13	Jersey

Tuples primary key p

5.16 What is the difference between Network and Hierarchical data models?

*** Networks support many to many relationships, while hierarchies do not.

5.17. How many steps do you need to find "10" in sequential search in the following file? How many for a binary search?
File : 2 5 7 10 20 30

4 and 3.

LOGICAL DATA STRUCTURE

- 6.1. What is a "data dependent application"? Explain with an example.

An application is called 'data dependent' when it is dependent on the data structure and access techniques. Therefore, the change of data storage structure or access technique may cause modification of existing application programs.

For example:

Suppose

```
-----  
Record A: | STDNO(4) | SEX(1) | NAME(20) |  
-----
```

where the number represents the length of each field

An application program was designed to use the 5th character to count the number of males and females. Now the length of STDNO is changed from 4 to 5 due to an increase in student enrollment.

Then the application program should be modified to use 6th character to count the number of males and females. This is a data dependent application.

- 6.2. If you were to design a STUDENT data base reflecting activity on campus, give an example of what kind of data items you would keep.

Example

Student ID	Student Address
Birth Date	Sex
Department	Courses taken
Courses taking	Grade
GPA	Status ...

PHYSICAL STORAGE STRUCTURE

- 6.3. Why is the null value important? Give an example to compute the average salary of employees, considering that at least one employee works with no salary, and another one is not working for this pay period.

The null value is a special value representing 'unknown' or 'inapplicable' value. Some system may assign zero to numeric field as default value of null value. In this case, the application programmer should differentiate between the number zero and the null value zero, both being used in the numeric field. For example:

Assume a student record with salary given to working students.

STD NAME	SALARY	
A	200.00	
B	400.00	
C	0.00	--- not working(default value)
D	0.00	--- working without salary

If we compute the average as normal method,
then $\text{AVG SALARY} = (200+400)/4 = 150$
but the real $\text{AVG SALARY} = (200+400)/3 = 200$.

- 6.4. Of all the types of physical structure you have studied, which ones seem to waste the least storage space? Why?

Sequential structure is most efficient as far as storage space is concerned since the other types of structure need extra space for storing indices or pointers, in addition to data.

However, when data is redundant, then the cost of storing data override the pointer cost.

6.5. What kind of data model can be represented by tree structure?

Hierarchical model

6.6. Describe the advantages and disadvantages of serial search and binary search.

Advantages:

Serial Search:

- * Simple and easy
- * Applicable for both ordered or unordered files

Binary Search:

- * Good performance for large files

Disadvantages:

Serial Search:

- * Poor performance for large files

Binary Search:

- * Not possible for unordered files

6.7** There are at most 50 students without name duplication. Give an example of a hash function (key value = student name) and consider problem occurring from the application of the hash function.

Assign number to each letter as alphabetic order.
i.e. A = 1, B = 2, C = 3, ...

Then

address = $f(\text{student name})$
 = (sum of each letter number of the name) mod K
where K is an integer greater than 50.
(Usually choose K as a prime number to reduce collision, i.g. 53, 59 or 61.)

For example:

If the student name = Martin James, then
address = $(13+1+18+9+14+10+1+13+5+19) \bmod 59$
 = $(103) \bmod 59 = 44$
where K = 59.

Problem:

There would be some occasions where the same address could be generated by a number of different names. This kind of problem is called "Collision". There are several kinds of strategies to solve the collision in the application of hash function.

DATA DEFINITION

7.1. What are the disadvantages of data redundancy? Why is data redundancy sometimes allowed?

Advantages:

- * Easy and fast search
- * Useful error detecting (using parity check)
- * Easy recovery (using replicated data)

Disadvantages:

- * Storage waste
- * May cause data inconsistency
- * More time needed for updating

7.2** In a university, there are 1000 students; each student takes 3 courses.

Show the redundancy in the following relation:

StudentID	StudentName	Address	Course
(5)	(10)	(30)	(5)

= Storage Required
per Student / per Co

Give a solution to reduce the redundancy and compare storage spaces.

We can reduce the redundancy by splitting the given relation into two relation such that:

- R1 : StudentID, StudentName, Address
R2 : StudentID, Course

1) Given relation

$$\text{space} = (5+5+10+30) * 1000 * 3 = 150000$$

2) Use two relations

$$\begin{aligned}\text{space} &= (5+10+30) * 1000 + (5+5) * 1000 * 3 \\ &= 80000\end{aligned}$$

7.3. List some cases which can lead to data inconsistency.

- 1) Data redundancy
- 2) Incorrect updating
- 3) Poor Recovery

7.4. Give an example of what should be defined in a SCHEMA?

- Schema name
- Record(entity) name
 - Accessing method
 - Key(identifier)
 - Data item name, data type, length
- Set(relation) name
 - Owner name
 - Member name
 - Ordering method
 - Insertion and Deletion method
 - Accessing method

7.5. Give an example from 7.4 of a subschema.

DATA BASE INTERROGATION

8.1. What are the main steps required in a search cycle?

- (1) Logging in
- (2) Selecting files
- (3) Entering commands
- (4) Printing results
- (5) Logging out

8.2. Give examples of what kind of information is provided by the system when a user is logging out.

- * Output requested
- * Time usage
- * Cost of the session
- * Other comments

8.3. What is the structure of a relational expression?

<operand> <relational operator> <operand>

8.4. Give examples of some common standard built-in functions which are useful for arithmetic computation.

SUM	-MEAN
MIN	MAX
AVG (Average)	STDDEV (Standard Deviation)
MOD	

8.5. What are the advantages of creating a user search profile?

It facilitates efficient searching, and thus brings down the cost.

8.6. Why is free text searching more expensive than index searching?

The search through the file is usually a sequential search, and therefore it takes a long time.

8.7. When is the free text search more desirable than the index search?

When the term searched by the user is not an indexed term!

8.8. Why is the priority of logical operations important?

Each logical operator is assigned a priority and the search is executed according to this priority.
If the user does not know the priorities, the execution may produce quite a different result than what the users had anticipated.

DATA BASE UPDATE

11.1. Why is the update history file useful?

It is a necessary tool in the recovery process

11.2. What is "deadlock"? Give an example of a deadlock situation involving locking mechanisms.

One of the advantages of a data base is that it is a multi-user system with data sharing. But there are some problems when two (or more) users attempt to update the same data simultaneously. "Lost update" and "inconsistent retrievals" are typical problems of simultaneous data sharing.

One of the common solution to a data sharing problem is to prevent another user from accessing the data that is currently in use (i.e.: the data being updated is the exclusive domain of the first person accessing it).

However, the exclusive locking technique, leads to another problem called "Dead lock".

Dead lock is a situation which results when two (or more) users request locks on the data which has been locked by a previous user.

Therefore, nobody can be granted access to the data forever in a dead lock situation.

For example:

User1	Lock	Data1	
User2	Lock	Data2	
User1	request	Lock Data2	--- waiting
User2	request	Lock Data1	--- waiting

Since User1 and User2 can not finish updating, they do not release Data1 and Data2 respectively, which leads to dead lock situation.

11.3** Time stamping mechanisms are a kind of deadlock-free mechanism. Explain the technique.

The basic concept of time stamp mechanism is to assign a unique timestamp for each transaction as a priority.

The dead lock situation occurs only when there is a cycle among waiting transactions.

Since the timestamps are issued uniquely in increasing order, no two same cycles are possible and hence no dead lock occurs.

DATA BASE REDEFINITION

12.1. Should you redefine the logical structure when you redefine the physical storage structure of the existing relation? Why?

No.

Since the logical data structure is independent of the physical storage structure, we need not redefine the logical structure. For example, although the physical storage structure can be changed from sequential file to linked list file, the users view of the logical data structure remains unchanged.

However, if the physical storage structure redefinition involves the deletion of some data items represented in the logical data structure, then the user should be aware of such changes.

ADMINISTRATIVE FUNCTIONS

12.2. When an organization wishes to change from one system to a new one, who is responsible for the transition?

The System Administrator

DATA BASE SECURITY

13.1. What is the difference between authentication and authorization?

Authentication:

Verification of identity to enter the system

Authorization:

Verification of access right to access an object

13.2. Explain the "Access Control List"?

Common access rights are:

- (1) read(R) access
- (2) execute(E) access
- (3) write(W) access

The access control list is a list which identifies each type of access proper to each user request.

For example:

OBJECT \ USER	user1	user2	user3	...
user1.object1	REW	R	R	
user1.object2	REW	RE		
user2.object1	R	REW	REW	
user2.object3	REW	REW		
user3.object5			REW	

where the blank represents no access right.
Therefore, when a user is trying to access an object that does not belong to him, the system searches the access control list to verify the authorization before allowing him access to the object.

13.3. A is going to send an important message (M) to B in who is at another site, through unprotected telephone line.
Suggest a method to ensure the security of the message.

Cryptography

Step (1) A enciphers M to M' by using a secret key.

Step (2) A sends M' to B through the telephone line.

Step (3) B deciphers M' to M by using the predefined secret key.

13.4. What kinds of methods are used for authorization checking?

- * Password
- * Cryptography
- * Access Control List
- * Procedure_based Access Control

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HOMework I I

PERFORMANCE MEASUREMENT AND EVALUATION

15.1 Why is the efficiency of execution being studied at different levels?

Execution efficiency depends upon a number of different system characteristics. In order to determine where the roots of the problem are, it is necessary to isolate and identify specific problem areas at different levels.

15.2. List at least two tools (or techniques), available for Performance Measurement and Evaluation. Give a brief description of each tool you selected.

Software Monitor
Hardware Monitor
Benchmark and Synthetic Programs
User Questionnaires
Evaluation Forms

15.3 List four measurement parameters used to support user interaction analysis performance measurement and evaluation. Explain each of them briefly.

- 1/ Response time: the time duration between the initiation of a request and the fulfillment of that request.
- 2/ Output Format Complexity: the degree of difficulty associated with the user interpretation of output from the system.
- 3/ Completeness of output: the ability of the system to retrieve and present to the user all of the information that the user requested.
- 4/ Convenience of Access: the degree to which the system is easy to learn and to use.

15.4 List four measurement parameters used by the system, in order to check efficiency of execution.

- * CPU Time (The amount of central processor time that is required to satisfy a request)
- * I/O Time (The amount of I/O time required)
- * Cost (The total cost of a request)
- * Storage Requirements (The amount of storage space needed by the various components of the system, and by the data bases supported by that system)

BIBLIOGRAPHIC DATA BASE DESIGN

- 17.1. Assume you are designing a book file in a library.
Design the book record format, and specify indices. (Choose
data type and length for each item in a record)

EXAMPLE

item name	data type	length
-----	-----	-----
Library index no.	decimal	10
Title	alphanumeric	50
Author	alphabetic	45
Publishing date	date	6
Library Congress no.	integer	7
Publisher	alphanumeric	60
Pages	integer	4
Language	alphabetic	3
Keyword	alphanumeric	60
Abstract	alphanumeric	variable

index term --- Library Index no.
 Title
 Author
 Library Congress no.

BIBLIOGRAPHIC FILE STRUCTURE

19.1. Assume a sequential file organization.

If the record length is fixed, the next record can be easily found from the current record.

i.e. the address of next record =
current address + record length

How do you implement the variable length records in a sequential file? How do you recognize the next record position?

- (1) Using a special symbol as a separator of records.
- (2) Design the record to contain its own length so as to be able to compute the next record position.
- (3) Maintain a directory which contains the starting address of each record.
- (4) Maintain fixed length records and link to the overflow storage area for the oversized records.

19.2. What are the advantages and disadvantages of the balanced tree?

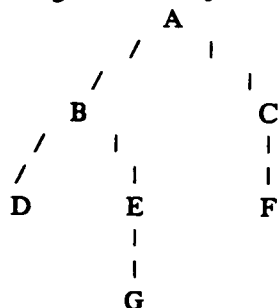
Advantage:

In a balanced tree, the average length of path from the root node to the object node maybe shorter than in an unbalanced tree. i.e. the average search time is better.

Disadvantage:

A balanced tree needs to be reorganized (balanced) each time nodes are inserted or deleted.

19.3. Give two examples of physical representation of the following tree by using links(pointers).



(1) Using multiple children pointers

Format: | data | ptr1 | ptr2 | ... | nil |

| A | ptr(B) | ptr(C) | nil |

| B | ptr(D) | ptr(E) | nil |

| C | ptr(F) | nil |

| D | nil | | E | ptr(G) | nil |

| F | nil | | G | nil |

(2) Using first son & twin pointer

Format: | data | ptr(son) | ptr(twin) |

| A | ptr(B) | nil |

| B | ptr(D) | ptr(C) | | C | ptr(F) | nil |

| D | nil | ptr(E) | | E | ptr(G) | nil |

| F | nil | nil | | G | nil | nil |

(3) Using parent pointer

Format: | data | ptr(parent) |

| A | nil |

| B | ptr(A) |

| C | ptr(A) |

| D | ptr(B) |

| E | ptr(B) |

| F | ptr(C) |

| G | ptr(E) |

19.4. What is the major advantage of clustered files in information retrieval?

A retrieval of specific document will cause the automatic retrieval of other related documents since all related documents are grouped together (clustered).

19.5. Why does Indexed Non-sequential file structure need full indexing?

Since the records are not ordered by key, the unindexed records can not be found if partial indexing is used.

19.6. Data insertion is easier in Indexed Non-sequential file than in Indexed Sequential file, since data reorganization is not needed. But Indexed Non-sequential file is not as good in normal applications. Why?

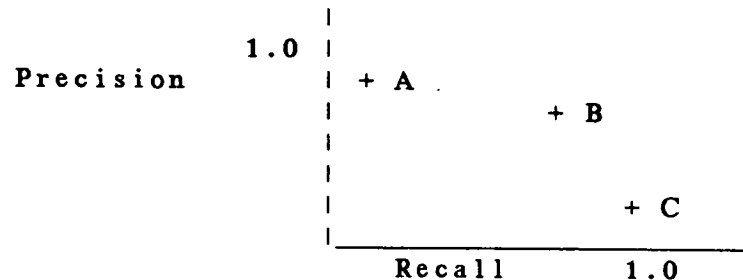
Since the Indexed Non-sequential file needs full indexing, it takes more storage space and in a large file, it may need longer searching time.

19.7. Clustered file structure is a unique concept. Some problems have been pointed out for this type of files. List some of the negative aspects.

- (1) Complexity of Performance Evaluation
- (2) Complexity of Cluster Generation
- (3) Size of Storage Space Required
- (5) Time Needed for Retrieval
- (4) Lack of Research

VOCABULARY CONTROL

- 21.1. Assume three searches A, B and C on a data base.
The following graph represents 'Recall' & 'Precision' of each search.
Give comments for each search based on the characteristics of terms used in the search.



- A --- used too general terms
- B --- good search
- C --- used too specific terms

- 21.2. The choice of index terms representing each document is very important for an efficient information retrieval system.
Discuss the problems that may occur when the index terms are assigned manually.

- (1) Need Skilled Indexers
- (2) Evaluating the Document Subjects is Time Consuming
- (3) Time Dependency of Indices
- (4) Subjectivity of Indexers

- 21.3. What index terms would you assign to any scientific documents?

- (1) Title
- (2) Key words
- (3) Words in chapter heading

21.4. Suppose A = number of relevant documents retrieved.
Then we can define as
Recall = A/B Precision = A/C
Define B and C in above formula.

B = number of relevant document in the data base
C = number of documents retrieved

21.5. Differentiate between Bound and Online Thesaurus.

Bound --- select terms to help design search.
Online --- show postable terms.

21.6. How do you implement the search enlargement and search restriction by using Thesaurus?

- (1) Search enlargement
 - use Broader terms
 - use Related terms
- (2) Search restriction
 - use Narrower terms
 - use Related terms

21.7. In general it is desirable to exclude very rare concept terms from the Thesaurus, since those terms are not expected to produce many matches.

What about those terms with a very high frequency of occurrence?

Terms occurring with a very high frequency are also excluded from the Thesaurus, since they produce too many matches for effective retrievals.

BIBLIOGRAPHIC DATA BASE SEARCHING

25.1. What is the main capability of 'HELP' function?

Introduce the semantic and syntactic description of each commands for user.

25.2. Categorize the following data sublanguage commands into data definition language and data manipulation language.

Create_database	Destroy_database
Create_file	Destroy_file
Open_file	Find_record
Modify_record	Insert_record
Order_file	

DDL --- Create_database	Destroy_database
Create_file	Destroy_file
DML --- Open_file	Find_record
Modify_record	Insert_record
Order_file	

25.3. What is the primary advantage of procedural host based data sublanguage?

Since the data sublanguage is mixed with or called from the host language, user can use data base information in the host language program directly.

25.4. Describe the major funtions of bibliographic data base search languages.

- (1) Search and Selection
- (2) Retrieval
- (3) Reporting

25.5. In search languages the queries consist of relational conditions and boolean conditions.

Give an example of the combined conditions.

```
author_name = "DATE" AND publishing_date >= 1980  
title = "DATA BASE" OR key_word = "DATA BASE"
```

*
*
* HOMEWORK I I I *
*
*

BIBLIOGRAPHIC DATA BASE SEARCHING

26.1. What are the common language operations and functions supported by search languages?

Operations:

Boolean Operation (AND, OR, NOT)

Relational Operations (EQ, NE, GT, LT, GE, LE)

Functions: Builtin Functions (count, exist)

Report Generation Functions (Default report format and user defined report format)

26.2. What are the common language commands available in Procedural host languages? Explain briefly each function.

OPEN specify file or record to access

CLOSE specify file or record after accessing is completed

FIND a record in a file

GET transfer a record to the program work area

ORDER sort file in ascending or descending order

26.3. Describe the characteristics of the following languages?

a/ Procedural, Host Language Based languages

b/ Self-Contained Structural Query languages

c/ Interactive, Prompting Oriented languages

d/ Batch, Forms Oriented languages

e/ Interactive, Forms Oriented languages

a/ Sequential Instructions

b/ Simple, Concise and English-Like command languages

c/ User-Friendly, prompt oriented, interactive, online command language

d/ Tabular Syntax filled as a form

e/ Tabular syntax filled on the screen of an interactive terminal

26.4. Which type of languages will not support report generation capabilities?

Procedural, host language based languages.

26.5. Which types of languages are dependent on data structures, and which are not?

Dependent: Procedural Host Language Based languages
Not Dependent: All other languages

26.6. In interactive, prompt oriented languages, for what information is the user being prompted?

The user is prompted:
for granting access, for next command, for system usage
comments or for help requests.

26.7. Why do users need search languages?

*** To retrieve data required by the users from the data base.
To formulate a request for data in a simple, fairly friendly
way.
To have non-procedurality in language style.

INSTRUCTIONAL & DIAGNOSTIC FEATURES

36.1. What is the content of a language reference manual?

A language reference manual contains the complete description of the usage and syntax of the language, as well as error diagnostics.

36.2. What kind of informations is contained in handouts for beginners?

How to login / How to logout
Brief explanations of terminal keys
Brief explanations of help facilities
Brief explanation of directory structure of the work environment
List of online tutorials available on system for beginners
How to create Text and simple editing features

36.3. List three types of software tools.

Text Editor
Word Processor
Statistical Package
Graphic Tools
Spread Sheets

PHASES OF THE PME LIFE CYCLE

40.1. List some of the data needed as measurement parameters.

- 1/ Starting Time of Session
- 2/ Starting CPU Time
- 3/ Ending Time of Session
- 4/ Ending CPU Time
- 5/ Names of Files Accessed
- 6/ User Comments On Search
- 7/ List of Errors and Types
- 8/ Contexts of Errors

40.2. What is meant by "Performance of the System"?

The Performance of a system is the indication of how well a system performs. It indicates the real value of the system, as a tool to realize some tasks.

40.3. What is meant by "Evaluation of System"?

It is the process of analyzing the functioning and/or usage of a system, so that decisions can be made concerning the effectiveness of the system in satisfying its design objectives.

40.4. What is the purpose of Performance Measurement and Evaluation?

It is a tool to help determine the actual performance of the system. It also helps in estimating or projecting the performance of a new system, or the effects of a new workload on an existing system. Finally, it helps improve the capabilities of a system, by allowing constant tuning.

40.5. Identify the generic objectives of Performance Measurement and Evaluation.

- 1/ Measure and evaluate the execution efficiency of a system (the emphasis is on the system)
- 2/ Measure and evaluate the user's interactions (the emphasis is on the user)

40.6. Why is Accuracy being stressed as a tool in Performance Measurement and Evaluation?

The data collected must be accurate in order to determine the actual performance of the system. If the measurement tool is inaccurate, the purpose of PME can not be achieved.

TRADITIONAL OBTRUSIVE USER MONITORING

42.1. Define Recall.

Recall measures the ability to retrieve from the system as much relevant information as possible.

42.2. Define Precision.

Precision measures the ability to retrieve from the system only the desired information.

42.3. Let the number of relevant documents retrieved be 10, and the total number of documents in the data base be 20. If the total number of documents actually retrieved is 15, indicate the Recall Ratio and the Precision Ratio.

Recall : 10/20 (50%) Precision: 10/15 (66.6%)

42.4. Why are offline IS&R Systems oriented towards high recall?

In offline IS&R Systems, users submit their search requests to the retrieval center. After some time, the user receives the printed output. Such a user expects the final output to contain all the relevant information, even if the result is embedded among less relevant documents: he will read the whole print, sorting out what he really needs.

On the contrary, a searcher online will have a tendency to try to select only what he really needs, in order to reduce the searching cost.

That is why offline search is oriented towards high recall, and online towards high precision.

42.5. Indicates at least three human factors to be considered in traditional obtrusive user monitoring.

- 1/ Human Behavior Characteristics (human behavior may change considerably under different circumstances).
- 2/ Variability Control (Experiments to measure performances of different groups under different conditions require that the groups be selected in such a way that their overall characteristics are nearly identical).
- 3/ Legal and Moral Factors (The information collected can not be legally used without the permission of the subjects. The experimenter has the responsibility to protect the users' confidentiality).
- 4/ Impact on User Actions (The users interactions with the system may be inhibited if he believes his actions are identifiable).

42.6. What factors have to be considered in designing controlled usage experiments?

- 1/ Identify and narrow the scope of experimental factors whose impacts will be studied.
- 2/ Identify contributing factors which influence variance in experimental factors.
- 3/ Determine how the changes in experimental factors must be presented to the subjects of the experiment.

42.7. Give some examples of subjective assessment of traditional user monitoring.

Questionnaires and ratings collected from the users give an idea of the system usability, and of the value of the interfaces. In particular, it gives a chance to the user to comment on:

- the accuracy of the information
- the completeness of the information
- the ease of use of the system
- the help in correcting errors

Also, interactive comments will be accepted by the system. Users have the opportunity to express freely their problems, make comments on unexpected occurrences and any aspects of the system. Users are motivated to provide comments.

UNOBTRUSIVE USER MONITORING

44.1. What are the Software Engineering characteristics measured by monitors?

- 1/ Reliability: how often system failures occur (i.e.: abnormal termination)
- 2/ Correctness: does the system actually perform all the functions expected by the user?
- 3/ Learnability: the time required by a user, before obtaining a certain level of proficiency.
- 4/ Usability: How easy is using the system, once a user has been taught.
- 5/ Flexibility: Can the system be easily changed, in order to meet new users' requirements?

44.2. What are the measurement parameters included in user error, and error recovery analysis?

- 1/ Error Rate: Measure changes over time of the number of errors made by the users.
- 2/ Type of Errors
- 3/ Use of Help Commands

44.3. What are the benefits of advanced unobtrusive user monitoring?

It helps identify
Enhancements to the system
Enhancements to monitors
It also indicates what modifications should be done to the experiment, and gives feedback to the system designers.

ATTACHMENT 3.8

**COURSE DEVELOPMENT PHASE:
FIRST DRAFT OF PROPOSED COURSE
NASA RECON USAGE ASSIGNMENTS**

N A S A

N A S A

```
*****
*
*
*           N A S A   /   R E C O N
*
*   C O U R S E   D E V E L O P M E N T   S E R I E S
*
*
*           F I R S T   D R A F T :
*
*   P R O P O S E D   C O U R S E   N A S A / R E C O N
*
*           U S A G E   A S S I G N M E N T S
*
*
*****
```

The NASA/RECON Course Development Series contains a collection of draft course development deliverables representing draft results of the educational course development activities being conducted pursuant to the specifications of National Aeronautics and Space Administration Contract Number NASW-3846.

The entries within this series are in "draft" form; they represent work in progress and work in various stages of revision. As such, they should not be construed as final products nor should they be viewed as material for widespread distribution. All entries within this series will be subjected to multiple development phase revisions, to course pilot administration, and to final course pilot evaluation and final revision prior to being distributed as final course deliverables.

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C O U R S E

D E V E L O P M E N T

*
* USAGE ASSIGNMENTS *
*
* WITH *
*
* ANSWER KEYS *
*

RECON USAGE ASSIGNMENT I

(Instructor's Note)

The purpose of this assignment is to introduce the students to the RECON system. Before this assignment is given, the instructor should explain local policies and terminal usage to the students.

The log-in procedure is not discussed in this assignment because this procedure will vary from school to school.

The students should read the section 1 through 3 of the NASA/RECON system user's manual before starting this assignment.

RECON USAGE ASSIGNMENT 1 (KEY)

Objectives:

- (1) RECON System Logging-IN and OUT
- (2) Basic Commands
 - BEGIN, BEGIN BYPASS, SELECT, COMBINE,
 - DISPLAY, END SEARCH, END SEARCH BYPASS,
 - HELP, PAGE

- (1) LOG-IN to RECON by using log-in instructions.
- (2) Once accepted by the RECON system, enter the following commands one at a time when the system responds "ENTER:".

BEGIN

(* follow the system questionairs to enter
the file collection D(documents) *)

I (* intermediate user level *)

EXPAND ANIMALS

SELECT E06

EXPAND NAVIGATION

SELECT E06

EXPAND E06

COMBINE 1 AND 2

DISPLAY 3/2/item number

(* item number is an integer in the set *)

(* hand copy the title, author and publishing date,
and turn it in *)

HELP

HELP X210

(* or other number you are interested *)

PAGE

END SEARCH

BEGIN BYPASS F

I (* intermediate user level *)

SELECT ST/RADIATION

(* if the user know the correct indexed term,
he can use SELECT without EXPAND command *)

DISPLAY 1/2

END SEARCH BYPASS

- (3) Log-out from RECON
 - (* NOTE: make sure you are logged out from RECON system completely *)

RECON USAGE ASSIGNMENT II

(Instructor's Note)

The purpose of this assignment is to allow the students to develop their first search based on the Subject search. The basic search commands were introduced in the first assignment but were not discussed in any details.

The students should understand the capability of EXPAND command by using term or reference number, and COMBINE command with varying boolean expressions. SELECT and SET STATUS commands should also be discussed in the class before giving this assignment. The SET STATUS command is useful to know the status of all sets which have been created so far.

It might be desirable to give some subject terms which are of interest to the students instead of the terms suggested in the problems.

There may be several ways to solve the given problems. The solutions given are only examples of techniques. Note also that the set numbers in the solution may not be correct because they depend on the current set status.

Finally, the number of hits suggested may differ slightly from your actual search, since files are continuously being updated.

RECON USAGE ASSIGNMENT II (KEY)

Objectives:

- (1) File selection
- (2) Search Commands and Techniques
SELECT, EXPAND, COMBINE, SET STATUS,
Subject searches --- Major Term(MJ)
Minor Term(MN)

- (1) Find all references on BLACK HOLE (ASTRONOMY) by Subject Term searching on:

File D --- (2007) Hits

File F --- (50) Hits

File N --- Total (2057) Hits

Total (2057) Hits

Are your two totals the same?

bb D

i

x BLACK HOLE (ASTRONOMY)

(* ST(subject term) is the default file code
in Documents file *)

s E06

bb f

i

x ST/BLACK HOLE (ASTRONOMY)

(* LT is the default file code in F file *)

s E06

bb n

i

x ST/BLACK HOLE (ASTRONOMY)

s E06

- (2) Find out the Title and Report Number whose accession number is 83N13147.

Title:

Report Number: NASA-TM-85141

(* if you know the accession number you can display directly
*)

d 83N13147

- (3) How many accessions contain OZONE LIGHTNING as subject term in file D? (start from EXPAND OZONE LIGHTNING)

bb D

i

(* 'OZONE LIGHTNING' is not an indexed term, so you
have to divide and combine them *)

x OZONE LIGHTNING

s E05 (* select subject term OZONE *)

x LIGHTNING

s E06

c 1 * 2 (* combine the sets OZONE AND LIGHTNING *)

- (4) How many accessions contain both (in file D):
(A) Major Term: TELECOMMUNICATION
(B) Minor Term: MICROWAVE CIRCUITS

s MJ/TELECOMMUNICATION

s MN/MICROWAVE CIRCUITS

c 1 * 2

- (5) Find all references by Subject Term, in file D on:
Celestial Sphere and Solar System but not (Mars or Moon).

How many sets are created to get this solution? (Display set descriptions)

s CELESTIAL SPHERE

s SOLAR SYSTEM

s MARS

s MOON

c 1 * 2 -(3 + 4)

ss (* display set status *)

RECON USAGE ASSIGNMENT III

(Instructor's Note)

The purpose of this assignment is to expand the student's ability to extract information from the system. The use of LIMIT and FREQUENCY will be introduced as well as the use of complex SEARCH EXPRESSION. Search by different fields, Proximity and Phrase search, and Root and Range search will also be introduced.

The students should understand the concept of various searchable fields for each file collection, prior to performing this assignment. The searchable fields are described in the user's manual.

The utilization of search expression needs the user to combine a number of sets utilizing various boolean expressions. The students should be familiar with the usage of the COMBINE command.

The utilizations of searches for Report Number and Authors consist of simply finding out the accession numbers which are references to particular reports or authors within a given file collection.

In the text search practice, the assignment requires the utilization of Proximity and Phrase searches.

Root and Range searches introduce the concept of retrieving documents, based on the root of a word or a range in either the subject, the text or the title fields.

RECON USAGE ASSIGNMENT III (KEY)

Objective: Advanced Search Techniques
LIMIT, LIMIT ALL, RELEASE, FREQUENCY,
SEARCH EXPRESSION,
Search by Author, Report Number, Contract Number...
Text Search --- Proximity and Phrase search
Root and Range Search

- (1) A. Find all references about ACID RAIN in the file D, using the Thesaurus Term, the Title, the Abstract, and the Analytic Note (use SEARCH EXPRESSION).
B. Find the same in the Book file using the Thesaurus Term, the Title, and LT for ACID and RAIN (combined).
C. Find the same in file N.

bb D
i
se UTP/'ACID RAIN' + AX/'ACID RAIN' + AL/'ACID RAIN'
(* D file --- 156 Hits*)

bb F
i
se TTL/'ACID RAIN' + (LT/'ACID' * 'RAIN')
(* should use single word for LT search *)
(* F file --- 66 Hits*)

bb N
i
se UTP/'ACID RAIN' + AX/'ACID RAIN' + AL/'ACID RAIN'
se TTL/'ACID RAIN' + (LT/'ACID' * 'RAIN')
c 4 + 8 (* combine the results *)
(* N file --- 222 Hits *)

- (2) Find the Accession Number for NASA-TM-85141 (Report Number).

d RN/NASA-TM-85141
(* ACC: 83N13147 *)

- (3) Locate an energy document by Karen Gordon and Elizabeth Baccelli.

s AU/GORDON, K.
s AU/BACCLLI, E.
c 1 * 2
(* ACC: 83N13623 *)
d 3

- (4) How many periodicals have titles such as "Proceedings \$\$\$ Conference"?
(* where '\$\$\$' represents any words *)

Which Major Subject Term in the resulting set is the most frequently used.

bb M
i
s PTL/"PROCEEDINGS *9 CONFERENCE"
(* title proximity search *)
(* 3 Hits *)

f 1/MJ

- (5) In the Document file, how many references are found from the Title root: "MICROC"?

How many references have titles between MICROCOMPUTER and MICROCOPY?

bb D
i
s UTP/MICROC:
s UTP/MICROCOMPUTER:MICROCOPY

- (6) From the result of range search of (5), how many of them are published in 1975-1980?

l 2/75-80
(* where 2 is the set number of range search *)

- (7) Find the accession number of the document containing the definition of "Flying Peanut"?

s AX/'FLYING PEANUT' (* abstract search *)
d 3
(* ACC: 83A16400 *)

- (8) Find the book entitled "I want to change but I don't know how"?

bb F
i
s TTL/'I want to change but I don''t know how'
d 1
(* ACC: 82V52280 *)

RECON USAGE ASSIGNMENT IV

(Instructor's Note)

The purpose of this assignment is to show the students the use of the KEEP command and in the utilization of stored query sequences. The students, on completion of this assignment, should be able to create, save, delete, edit and execute stored queries. They should also be able to use the KEEP set for storage of selected retrievals.

The students should be aware that BEGIN and BEGIN BYPASS commands are not allowed in stored query sequences and that there is a limit of 50 commands per stored query sequence. The actual sequences to be executed should be very carefully designed in order to eliminate the possibility of having sequences using large amounts of time.

It is very useful to understand the capabilities of the three special characters in Query commands.

"!" --- no-execution capability

"/" --- no-store capability

"#" --- set-modification capability

The KEEP command is used to store the selected results in a special set: the set 99. This special set 99 is not displayed in set history.

It is highly recommended to have the students try all Query commands in addition to the given problems.

RECON USAGE ASSIGNMENT ,IV (KEY)

Objective: Stored Search Technique

KEEP, RELEASE,
QUERY (CREATE, EDIT, SAVE, /, !, #,
EXECUTE, ALTER, PAUSE, CONTINUE,
CANCEL, LIST, DELETE, REPLACE,
QUIT, PURGE, MEMBER)

- (1) Create a query sequence as explained below, and save the query in the library under the name QQ followed by the first 5 letters of your name.

- (A) Find all references on UFO's (in subject term).
- (B) Find all references on SOLAR SYSTEM (in subject term).
- (C) Combine the sets (A) AND (B).
- (D) Limit the accessions to material published between 1979 and 1982.
- (E) Display on the screen the first 2 items of the resulting set.

```
bb D
i
q create
s ST/UFO
s ST/SOLAR SYSTEM
c #1 * #2
(* set modifications are required *)
l #3/79-82
d #4/2/1-2
d
q save QQNAME
```

- (2) Display the list of the saved query and execute it in file D.

```
q list QQNAME
q execute QQNAME
```

- (3) Modify the saved query as follow and save under the same name.

- (a) Change the LIMIT of publication dates to 1970-1983.
- (b) Do not display on the screen.
- (c) Release the first three sets created without adding this operation to the query sequence.
- (d) Add the KEEP command to save all items of the resulting set without executing in edit mode.

```
q edit QQNAME
q list
q alter 4/1 #3/70-82
    (* change the LIMIT command in line 4 *)
q delete LAST 2
    (* delete last two commands in the query *)
/release 1-3
    (* release set 1 through set 3 without storing *)
!keep #4
    (* keep the limited set without executing now *)
q replace QQNAME
```

- (4) Display the query list and execute in file D.

Display all accessions kept (use format 1).

```
q list QQNAME
q execute QQNAME

d 99/1      (* keep set is set number 99 *)
```

- (5) Execute the query in file F and display all accessions kept.

```
bb F
i
q execute QQNAME
d 99/1
```

- (6) Delete your saved query from the library.

q purge QQNAME

RECON USAGE ASSIGNMENT V

(Instructor's Note)

The purpose of this assignment is to show the student's the facilities to output the informations retrieved.

The commands SORT and SPECIFY FORMAT are used to assist in organizing the data to be output in the order and format wanted. The students should consult the user's manual section about format, before starting this assignment.

Both the PRINT and TYPE commands are used to print out the information. But the instructor should be careful in discussing the PRINT command, since the PRINT command is used to produce offline printing and to mail output to the users.

The CURRENT and COMMAND STATUS commands are also presented.

RECON USAGE ASSIGNMENT V (KEY)

Objective: Output Request and Useful Commands
SPECIFY FORMAT, SORT, PRINT,
TYPE, CURRENT, COMMAND STATUS

- (1) Find all references about MICROCOMPUTER in the book file,
using text search.

bb F
i
s LT/MICROCOMPUTER

- (2) Specify the format as Accession Number, Publishing Date,
Library Congress Number, Author, Title, Abstract.

sf ACC,YER,CLN;AU;UTL;ABS
(* ACC, date and CLN are formatted in same line *)

- (3) Sort the answer of (1) by Title.

so 1/TTL

- (4) Display the first 2 pages and TYPE the items (5th through
10th) in specified format.

d 2/4/all
p (* display the next page of the set *)
t 2/4/5-10

- (5) Find all references about PC (personal computer) in subject
term and combine(AND) with the result of (1).

s ST/PC
c 1 * 3

- (6) Sort the answer of (5) by the Publishing Date in descending order, and display the first 2 pages.

so 4/YER, D
d 5/4/all
p (* display the next page of the set *)

- (7) Display current file collection.

cu FC

QUESTIONS FOR USAGE ASSIGNMENT I

- 1.1. What file is the default file on the NASA/RECON system, when user uses BEGIN BYPASS without specifying any file collection?

Documents file (file collection D)

- 1.2. When reading online a document of more than one page, how can you retrieve the previous page?

Use "PAGE -" command

QUESTIONS FOR USAGE ASSIGNMENT II

- 2.1. The searchable field codes(mnemonic) may vary for each file in RECON system.

Give the searchable field codes in Documents file and NALNET Books file for the following fields.

- (1) title (2) author (3) all text field

	Documents file	Books file
	-----	-----
(1) title	UTP	TTL
(2) author	AU	LA
(3) all text field	TX	LT

- 2.2. Explain the results of the following commands in the NASA/RECON system:

- (1) COMBINE 1-5/*
(2) COMBINE 1 * 2 -3
(3) COMBINE 1 * 2 -(3 + 4)

- (1) The new set resulting contains those items which are common to set 1 through set 5.
(2) The new set contains those items which are common to both set 1 and set 2 but not to set 3.
(3) The new set contains those items which are common to both set 1 and set 2 but not to set 3 nor to set 4.

- 2.3. When a user uses EXPAND command to expand an alphanumeric term, the RECON system displays terms from the appropriate inverted file that are alphabetically adjacent to the input term.

How, in the NASA/RECON system, can you expand a term in the NASA Thesaurus? (Give two different types of examples)

- (1) Using Thesaurus file code.
example: EXPAND TS/subject term
(2) Using E-reference (or R-reference) number from a previous EXPAND display.
example: EXPAND E06

QUESTIONS FOR USAGE ASSIGNMENT III

- 3.1. What is the function of the LIMIT RELEASE command in RECON system?

The LIMIT ALL command remains in effect until an END SEARCH command is entered or until a LIMIT RELEASE command is entered.

i.e. The LIMIT RELEASE command releases the limitation previously created by a LIMIT ALL command.

- 3.2. In a phrase text search, stop words are being ignored by the system.

What are the Stop words and why are they ignored before the command execution?

The Stop words are words which are used frequently in the text and do not affect the main concept of the text, i.e. such that articles, pronouns, conjunctions, ...

The Stop words are defined by the system and eliminated in order to reduce the size of the text inverted files and speed up processing.

- 3.3. Explain the following RECON system command.

SELECT --ST/ROOTS

Select both the items that are indexed to "ROOTS" and the term that precede "ROOTS" in the Subject Term file.

- 3.4. Decimal points, commas or some other special characters are treated as blank characters in text search of RECON system.

How do you search "10.56" by using

(1) Proximity search

(2) Phrase search

in Abstract field of Documents file?

(1) Proximity search

S AX/10 *+1 56

(2) Phrase search

S AX/'10 56'

3.5. The SEARCH EXPRESSION command allows user to enter multiple SELECT and COMBINE commands with a single entry in RECON system.

How many sets are created by the following command?
List each set with its description.

SEARCH EXPRESSION (ATL/ACID RAIN) + AX/'HUMAN LIFE'

set no.	description
-----	-----
1	ATL/ACID
2	ATL/RAIN
3	1 * 2
4	AX/HUMAN LIFE
5	3 + 4

QUESTIONS FOR USAGE ASSIGNMENT IV

- 4.1. The KEEP command is used to save a single item or a group of items of particular interest in a special KEEP set in RECON system.

Which set(set number) is reserved for the KEEP command?

Set 99

- 4.2. List the four query modes of operations in the NASA/RECON system.

- (1) CREATE mode
- (2) EDIT mode
- (3) EXECUTE mode
- (4) PAUSE mode

Note: Normal mode is not a query mode.

- 4.3. Most of the RECON system commands can be stored in a stored query sequence.
What commands are not permitted in a stored query sequence?

- (1) BEGIN
- (2) BEGIN BYPASS

- 4.4. How can you delete the stored query sequence in RECON system library?

Use "QUERY PURGE stored-query-name"

- 4.5. Explain the "query command set modification capability" in RECON system.

If a stored query sequence is to be executed after previous commands have created sets, the set numbers in the stored query sequence may not correspond to the actual set numbers because of the presence of the preexisting sets.

RECON system use a special symbol#, to prefix any set number in any position in a command where a set modification is required. The set modification capability is only valid in the Query CREATE/EDIT mode.

4.6. True or False questions (NASA/RECON system).

- (1) QUERY ALTER command is valid when the user is not only in the QUERY CREATE/EDIT modes but also in the QUERY PAUSE mode.
- (2) When QUERY DELETE command is issued without operand, it deletes the first entered command in the query sequence.
- (3) When QUERY EDIT command is issued without operand (stored query name), the most recently stored query sequence can be modified.
- (4) A user in QUERY CREATE/EDIT mode can look another stored query list in the library.
- (5) If QUERY SAVE command is issued to the previously existing stored query name, it overwrites the existing stored query.

- (1) true
- (2) false
- (3) false
- (4) true
- (5) false

QUESTIONS FOR USAGE ASSIGNMENT V

- 5.1. The user's commands are placed in a queue to wait processing when the users transmit commands faster than the central computer can process them.

Which RECON system command can be used to find out the status of the transmitted command?

COMMAND STATUS

- 5.2. Sometimes a user may forget the file collection on which he/she is currently searching.

What RECON command would remind him?

CURRENT

- 5.3. RECON system provides four format options in the DISPLAY command.

Describe each format briefly.

Format 1 --- Only the accession numbers are displayed.

Format 2 --- A full citation is displayed.
This is the system default format option.

Format 4 --- A citation is displayed in the format specified by a previous SPECIFY FORMAT command.

Format 6 --- A full citation excluding abstract is displayed.

- 5.4. In the NASA/RECON system, the SPECIFY FORMAT command uses commas or semicolons to separate the field names from the operands.

What is the difference between comma and semicolon?

A comma in a SPECIFY FORMAT indicates that the field following the comma will be output on the same line; a semicolon indicates that the next field will be start on a new line.

BASIC RECON TRAINING

- 1.A. Find all references on ACID RAIN in file collection D using the Thesaurus Term, the Title, the Abstract, and the Analytic Note.

*** D = 416 hits

- B. Find same in file collection F(books) using the Thesaurus Term, the Title, the Sub(LC Indexing), and LT for ACID and RAIN (combined).

*** F = 57 hits

- C. The same for file collection P.

*** P = 473 hits

2. Find definition of "Flying Peanut".

*** 83A16400

3. Find Accession Number for NASA-TM-85141

*** 83N13147

4. Locate an energy document by Karen Gordon and Elizabeth Baccelli.

*** 83N13623

5. What is the most popular usage of the acronym EMP in the NASA data base?

*** ????????

6. Using major terms only on file D, how many accessions are found under Nitriding of Titanium and Titanium Alloys?

*** 64

7. Find the book "The World of Mathematics" (in 4 volumes).

*** 76V24889

ADVANCED RECON TRAINING

1. Find all references on the TUNGUSK METEORITE by searching on:
File D --- (112) hits File N --- total (116) hits
File F --- (4) hits

Total (116) hits

Are your two totals the same?

2. Find all references on UFO's in file F.
(Hint: Do not ignore the phrase "Flying Saucer")
*** Total (411+)

Sort answer by Publication Year and use a specified format as follow:

ACC, YER, CLN, AU, UTL, HLD

Display (first 2 pages) and print (overnight) sorted set in Format 4.

3. Using Phrase Search technique and Proximity Search technique on file G, D and F, find the accession and citation for:
"Bibliography on the Fatigue of Materials,
Components and Structures" Vol.2

Answer (ACC No. only) --- (79A21725) (79V26384)

Is there a Volume 1 in the collection?

If yes, ACC No. is (73V12022) (64N85407)

4. Which NASA Centers have Jane's All the World's Aircraft 1978-79?

*** (GSFC, JSC, LaRC, Hq.)

5. Order a listing of ACCIDENT PREVENTION MANUALS,
Sort by YER,D, Display in Format 4 (ACC,YER,UTL).

*** (23 hits)

6. Locate one or more Periodicals on LINGUISTICS OR PHLOLOGY,
Display in Format 2.

7. Using KEEP technique, construct a set of Accessions os the SUPERNOVA of 1054 (AD 1054).
 - (A) (10) hits --- D file
 - (B) (1) hits --- G file
8. Find an SP, RP or CP.
 - (A) Animal Navigation (72N25062 NASA-SP-262)
 - (B) Lightning Protection of Aircraft (78N11024 NASA-RP-1008)
9. Find a book entitled "Compendium of Communication and Broadcast Satellites 1958 to 1980".

*** (82A18116 and 82V12640)
10. Find a book entitled "I WANT TO CHANGE BUT I DON'T KNOW HOW".

*** (82V52280)

ATTACHMENT 4.1

**USL/DBMS NASA/RECON
WORKING PAPER SERIES
STANDARDS**

N A S A

N A S A

```
*****
*
*
*
*   U S L   /   D B M S       N A S A   /   R E C O N
*
*
*   W O R K I N G       P A P E R       S E R I E S
*
*
*
*
*
*
*   S T A N D A R D S
*
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```

The USL/DBMS NASA/RECON Working Paper Series contains a collection of reports representing results of activities being conducted by the Computer Science Department of the University of Southwestern Louisiana pursuant to the specifications of National Aeronautics and Space Administration Contract Number NASW-3846. The work on this contract is being performed jointly by the University of Southwestern Louisiana and Southern University.

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S T A N D A R D S

W O R K I N G P A P E R S E R I E S

USL/DEMS NASA/RECON
WORKING PAPER SERIES
STANDARDS

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Revised: March 29, 1984

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USL/DBMS NASA/RECON
 WORKING PAPER SERIES
 STANDARDS

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I. INTRODUCTION

The purpose of this document is to establish a set of standards for authors as well as reviewers of the USL/DEMS NASA/RECON Working Paper Series to maintain a consistent format among such working papers.

Each manuscript is to be reviewed by two reviewers assigned by the editor, using the reviewer checklist as a guideline for evaluating various issues concerning the content and organization of the manuscript, thereby, insuring its completeness, consistency, and appropriateness. The authors are then provided feedback with as much comments and suggestions as possible in the comment sheet. This process of review, feedback and update will be iterated until the final version of the manuscript is accepted for the Working Paper Series.

II. PAPER OUTLINE

1. INTRODUCTION

The purpose of the paper outline is twofold: to initiate the research process so that authors can begin identifying relevant work to be used in support of each paper, and to motivate authors to make an initial attempt at formulating the content of each paper and the approach that will be taken to the presentation of the material.

2. OUTLINE FORMAT

Each paper outline should be submitted in the following format:

2.1 Cover Sheet

The cover sheet should identify the author name, and the paper name.

2.2 Table of Contents

The table of contents should be an outline of the section and subsection titles that will appear in the paper. An example

is given below:

1. INTRODUCTION
2. SECTION ONE TITLE
 - 2.1 Subsection One
 - 2.2 Subsection Two
3. SECTION TWO TITLE
4. SUMMARY
5. REFERENCES
6. APPENDICES

2.3 Detailed Table of Contents

For each section and subsection identified in Section 2.2, provide further details about the content of each section. Your outline should provide details about what will be presented and how it will be presented, possibly identifying examples, figures, and tables that you might use. In general, the detailed table of contents should describe the approach you intend to take in presentation of the paper. Appropriate references should be included within the outline and a list of all references should be included at the end of the outline.

2.4 List of References

A tentative list of references should be included within the

paper outline. This is a tentative list since you will probably add more references or decide not to use some of the initial references. Remember that the objective here is to initiate the research process.

All references should be listed alphabetically by the first author's last name. The reference identification is enclosed in square brackets. The brackets will contain the first author's last name followed by the year of the publication (last two digits of the year only). An example of a reference is given below:

[Ullman, 79]. J. D. Ullman, Principles of Database Systems, Computer Science Press, Washington, D. C., 1979.

Notice that the first line of a reference should appear against the left margin of the page. Subsequent lines should be indented 4 spaces.

If the same author has more than one publication in the same year, the year in the reference identification should be followed by "a", or "b", or "c", etc. For example:

[Ullman, 79a].

[Ullman, 79b].

Within the report, the reference identification should be used to

refer to the book or article. For example:

A summary of the relational and the network models can be found in [Ullman, 79].

Multiple references on the same line should be separated by semicolons (example: [Ullman, 79a; Ullman, 79b]).

For more than one author of a publication, the reference should be listed as follows:

[Stonebraker, et.al, 76]. M. Stonebraker, E. Wong, and P. Kreps, "The Design and Implementation of Ingres," ACM Transactions on Database Systems, vol. 1, no. 3, Sept. 1976.

Also notice the difference between a book reference [Ullman, 79] and an article reference [Stonebraker, et.al, 76]. A book reference has the book name underlined and is followed by the publisher name, the city and state of the publisher, and the year the book was published. For article references, the title of the article is enclosed in quotes and the publication in which the article appeared is underlined. The publication name is followed by the volume, number, and month and year of the publication. All state and month names should be abbreviated.

III. ABSTRACT GUIDELINES

An abstract is an extremely compressed overview used separately from the paper as a locating device and an aid to potential readers who must determine if they need to read the paper. It varies in length from one hundred words to a maximum of two hundred and fifty words. However, since abstracts will be published or circulated separately from the paper or report as well as filed in indexes and information retrieval systems, they must be very compressed. In our Working Paper Series, abstracts should appear on a separate page between the title page and the table of contents page of the papers.

When writing an abstract, the author should keep in mind the following:

- (1) The abstract is not a substitute for the introduction of the paper. It is a supplement which in no way should affect the basic three-component design of the paper.
- (2) The abstract is not a miniature version of the introduction of the paper or the summary. Unlike the summary, it does not focus upon conclusions and recommendations; it is intended to help the reader to decide if he needs to read or obtain the paper. It does not convey sufficient information

to be instrumentally useful with the paper. Instead, it is intended to help readers to locate and screen potentially useful papers or reports.

For more details of the abstracting, the following guides will be useful:

Directions for Abstractors, published by the Chemical Abstracts Service; this is a standard guide for abstracting scientific research articles and reports.

Guidelines for Cataloguing and Abstracting, published by the Defense Documentation Center; this is the guide for abstracts to be stored in the federal government's centralized information retrieval systems, such as RECON.

IV. PAPER FORMAT

1. INTRODUCTION

Since our goal is to produce a series of working papers, it is important to establish standards in order to maintain a consistent format among the papers. The format described below establishes the standards that should be followed by all authors in the preparation of each paper. This document should also be used by all reviewers in order to insure a consistent format.

2. PAPER ORGANIZATION

Each paper will be organized into the following components:

- (1) Heading.
- (2) Sections.
 - (a) INTRODUCTION Section.
 - (b) Content Sections.
 - (c) SUMMARY Section.
- (3) References.
- (4) Appendices

2.1 Heading

The heading should identify the title of the paper. It should be centered and all letters should be capitalized.

2.2 Sections

There are three types of sections within each paper: an introduction section, several content sections, and a summary section. All sections are preceded by a section number and a section title. The section numbers are of the form X.1, X.2, X.3, ..., X.n, where "X" is the section number, and "n" is the subsection number. All letters in the section title should be capitalized. There should be two spaces between the section number and the first letter of the section title.

Only content sections can have subsections. Each subsection must be identified by a subsection number and a subsection title. All subsection numbers are of the form X.1.1, X.1.2, X.1.3, etc. Subsections can have sub-subsections if necessary, following the same numbering format. Subsection and sub-subsection titles should have only the first letter of all major words capitalized. There should be two spaces between the subsection number and the subsection title.

Both section and subsection numbers should be placed against the left-most margin of the page. Section titles should be

preceeded by three blank lines. The content of a section or subsection should begin one blank line below the section title. Subsection titles should be preceeded by two blank lines. Refer to Figure 1 for a sample paper format.

PERFORMANCE MEASUREMENT AND EVALUATION

1. INTRODUCTION

The introduction goes here.

2. FIRST CONTENT SECTION

A few lines here.

2.1 Subsection One

Subsection one goes here.

2.2 Subsection Two

Subsection two goes here.

3. SECOND CONTENT SECTION

A few lines here.

4. SUMMARY

Summary goes here.

FIGURE 1 Sample Chapter Format

2.2.1 INTRODUCTION Section

Each paper must have an introduction that orients the reader to the problems and issues to be addressed within the paper. The

introduction should be brief and should act as a "lead-in" to the remaining sections of the paper.

The word "INTRODUCTION" should be used as the introduction title.

2.2.2 Content Sections

Content Sections should contain the actual "meat" of the paper. Section titles should be short and should be named appropriately. If the title requires more than one line, the second line of the title should begin in the same column as the first character of the title on the previous line. An example is presented below:

2.2 THIS IS A VERY VERY VERY VERY VERY VERY
LONG TITLE

Content sections can have subsections and subsections can have sub-subsections, etc. Subsections should be used only if the section can be broken down into two or more parts. For example, in the sample below:

2.1 THIS IS A SECTION

2.1.1 This is a Sub-section

This is the content of the subsection.

2.2 THIS IS THE NEXT SECTION

2.1.1 is an unnecessary subsection. If there is not a 2.1.2, then 2.1.1 should not be used.

Sections which have subsections can optionally have introduction paragraphs between the section title and the subsection title. For example, the subsections below begin immediately following the section title:

2.1 SECTION TITLE

2.1.1 Subsection Title

Subsection content goes here.

2.1.2 Subsection Title

Subsection content goes here.

In contrast, the section below has an introduction before the beginning of the first subsection:

2.1 SECTION TITLE

This section addresses methods of statistical analysis for evaluating

2.1.1 Method One

Method one content goes here.

2.1.2 Method Two

Method two content goes here.

Either approach described above is acceptable.

2.2.3 SUMMARY Section

Each paper must have a summary that recaps the important issues addressed within the paper. The word "SUMMARY" should be used as the summary section title.

2.3 Tables and Figures

All tables and figures should be placed at the first available location closest to the first time they are referenced. They should be numbered sequentially with tables and figures each having their own numbering sequence. All tables should have an identifying title line centered at the bottom of the table. The indentifying line should consist of the word "TABLE", the table

number, and the table title. An example is presented below:

	A	B	C	D	E
1				
2				
3				
4				

TABLE 1 Table Title

Note that all letters in the word TABLE are capitalized. Only the first letters of major words in the table title are capitalized. There should also be two spaces between the table number and the table title, and two blank lines between the last line of the table and the table title.

When referencing a table, only the first letter of the word "Table" should be capitalized. For example:

Notice in Table 1 that

All formats described above for tables also apply to figures.

2.4 References

Appropriate references should be made throughout the paper to all work used to support the content of the paper. A list of all references should appear at the end of the paper, following all tables and figures. The word "REFERENCES" should be centered at the top of the page. The first reference should appear two blank lines below the reference title.

All references should be listed alphabetically by the first author's last name. The reference identification is enclosed in square brackets. The brackets contain the first author's last name followed by the year of the publication (last two digits of the year only). An example of a reference is given below:

[Ullman, 79]. J. D. Ullman, Principles of Database Systems, Computer Science Press, Washington, D. C., 1979.

Notice that the first line of a reference should appear against the left margin of the page. Subsequent lines should be indented 4 spaces.

If the same author has more than one publication in the same year, the year in the reference identification should be followed by "a", or "b", or "c", etc. For example:

[Ullman, 79a].

[Ullman, 79b].

Within the chapter, the reference identification should be used to refer to the book or article. For example:

A summary of the relational and the network models can be found in [Ullman, 79].

Multiple references on the same line should be separated by semicolons (example: [Ullman, 79a; Ullman, 79b]).

For more than one author of a publication, the reference should be listed as follows:

[Stonebraker, et.al, 76]. M. Stonebraker, E. Wong, and P. Kreps, "The Design and Implementation of Ingres," ACM Transactions on Database Systems, vol. 1, no. 3, Sept. 1976.

Also notice the difference between a book reference [Ullman, 79] and an article reference [Stonebraker, et.al, 76]. A book reference has the book name underlined and is followed by the publisher name, the city and state of the publisher, and the year the book was published. For article references, the title of the article is enclosed in quotes and the publication in which the article appeared is underlined. The publication name is followed by the volume, number, and month and year of the publication. All state and month names should be abbreviated.

3. INDENTATION, SPACING, AND PAGE NUMBERING

All paragraphs should be indented five spaces. All lines within a paragraph should be double spaced. There should be one blank line between each paragraph. The lines within a reference should be single spaced. There should be one blank line between each reference.

All pages should have a page number centered at the bottom of the page.

4. LISTINGS

To list a sequence of items, use the following format:

- (1) Two blank lines should appear before the listing.
- (2) Two blank lines should appear after the listing.
- (3) Use numbers to identify each item in the listing.
- (4) Enclose numbers in parentheses.
- (5) The first character of each item listed should be capitalized.
- (6) Indent the entire listing five spaces.
- (7) To continue an item on a second line, the second line should be in line with the first character of the first line.

- (8) Each item should end with a period.
- (9) For items identified by a single digit number, leave three spaces between the right parenthesis and the first word of the item.
- (10) For items identified by a two digit number, leave two spaces between the right parenthesis and the first word of the item.

5. PAPER STYLE

Since the objectives of this work is to produce tutorials as well as research reports, a different approach should be taken to writing the papers. Writing should be aimed at informing and teaching the intended audience as well as reporting research findings. Included below are a few guidelines which might help in achieving these type of writing objectives.

- (1) Writing must be ACCURATE. Check for deficiencies in the coverage of a topic. Avoid misleading statements. Do not include those personal opinion without sufficient support from the results of simulation, formal or informal proofs. Include sufficient examples, figures, and tables in order to clarify a subject.

- (2) Write clearly, concisely and in an organized manner. Avoid ambiguity, undue formalism and obscure notations and symbols. Define any symbols and all uncommon terminology before using in a discussion. Try not to make the subject harder than need be.
- (3) Set forth your assumptions about the reader's background. Make reasonable assumptions about the reader. Tell the reader what to expect, what material is included and what subjects are to be excluded. Perhaps the a more advanced reader may be advised to omit or briefly review certain introductory sections. Cover all topics as promised in the introduction. Recáp paper highlights and discuss conclusions at the end of the paper.
- (4) Make the subject as interesting as possible while still being informative. Try to stimulate the reader (if possible) rather than put him to sleep.
- (5) Accurately reference literature cited. Include references to articles which may provide helpful tutorials or background material on a subject.

V. UNDERLINING

To underline words within a paragraph or to underline the title of a book or journal within a reference, do the following:

1. Before the first character to be underlined, type "\016".
2. After the last character to be underlined, type "\017".
3. Use automatic underlining runoff instead of runoff. For example, instead of typing:

rf DEMS.NASA/RECON-X

type

aurf DEMS.NASA/RECON-X

Note that blank characters between "\016" and "\017" will not be underlined.

VI. AUTOMATIC NUMBERING OF TABLES AND FIGURES

Since all papers will be subject to change during the review process, it is important to avoid "hardcoding" things such as table and figure numbers into the paper if it can be avoided. As a result, all authors should follow the standards described below for automatically numbering all tables and figures.

1. At the beginning of each paper, initialize a figure counter and a table counter as follows:

```
.sr fig_ctr 0  
.sr tab_ctr 0
```

The ".sr" command is a runoff command that allows you to set the value of a variable.

2. Before assigning a number to a figure or a table, increment the appropriate counter as follows:

```
.sr fig_ctr %fig_ctr%+1  
.ur %fig_ctr%
```

The ".ur" command allows all variables surrounded by percent signs to be evaluated. The ".sr" command will then take the evaluated value, add 1 to the value, and store the result in fig_ctr.

3. Create a symbolic name to represent each figure and table within the paper. Use the names fig_1, fig_2, etc., and tab_1, tab_2, etc.
4. To automatically number each figure (or table), increment the counter (as described in part 2 above), and assign the counter value to the symbolic name using the ".sr" command as follows:

```
.sr fig_1 %fig_ctr%
```

The symbolic name can then be referenced.

VII. PAPER SUBMISSION POLICIES

1. INTRODUCTION

In order to promote an efficient reviewing process and to ensure uniformity between papers, the following list of standards will comprise the submission policy and must be adhered to.

2. STANDARDS

- (1) The Multics runoff/runout formatting facility is to be utilized for each version of the paper which is to be submitted for review.
- (2) Run the text segment through the MULTICS WORD LIST facility before submission. This will produce a list of all possibly misspelled words which can then be changed. The syntax for invoking the WORD LIST facility is:

ec >potluck>wl segment_name
- (3) Refer to Harbrace College Handbook for any problems with English grammar. One will be placed on reserve in Dupre Library for the use of all authors.
- (4) One copy of all work cited within the paper should be

submitted with the initial paper review. Book references are to be completely labeled in the upper left hand corner with the author names(s), book title, publisher, city of publication and year. Article references are to be labeled with the author name(s), article name, name of publication, volume and number, and month year of publication. Reference articles should be completely labeled in the upper left hand corner with same reference information which is to appear in the reference list. Refer to PAPER FORMAT standards.

- (5) Two copies of the paper are to be submitted on a full dprint (without removing margins).
- (6) The standard naming convention for paper segments stored on Multics will take the form:

DEMS.NASA/RECON-X.runoff

or

DEMS.NASA/RECON-X.archive

as appropriate, where X represents the paper number within the Working Paper Series.

VIII. REVIEW GUIDELINES

1. INTRODUCTION

The following notes are presented with the objective being to make the reviewing process a more effective and uniform effort. These guidelines are also intended to formally state the procedure which reviewers should follow. Included in these guidelines are reviewing hints, tasks to be performed and MULTICS pathnames for needed documents.

2. REVIEW PHILOSOPHY

It is hoped that the review process will result in a fair and critical evaluation of all papers involved. The success of the review phase is essential in order that a quality product may result. Standards have been set and will be enforced with the idea that the individual papers must eventually stand side by side. Be conscientious and honest in your review work. Don't shy away from making suggestions, but remember to be tactful. Criticize the paper not the author. Review with a critical eye and an open mind. Let's see if we can respond to this task in a professional way.

3. REVIEWING ENVIRONMENT ALGORITHM

- (1) Find a location with a peaceful atmosphere.
- (2) Allocate enough time to complete the reviewing task at one sitting.
- (3) Make all comments at the time of review.

4. FEEDBACK

Provide as much feedback as possible. If some aspect of the paper is inadequate or incorrect, give the reasons why it is so and perhaps some possible solutions. Feel free to mark the paper text with notes and additionally to make suggestions on the COMMENT sheet which is attached to the REVIEWER CHECKLIST.

5. STANDARDS

Use the REVIEWER CHECKLIST as a guide in evaluating various issues concerning manuscript content and organization. Refer to the PAPER FORMAT document as a standard for paper organization. YOU ARE DIRECTLY RESPONSIBLE FOR THE PAPER THAT YOU REVIEW.

6. REVIEW PROCEDURE

- (1) Receive paper manuscript during class presentation.
- (2) During the week that follows:
 - (a) Review paper.
 - (b) Complete REVIEWER CHECKLIST.
 - (c) Complete comment sheet.
- (3) At next class return to the editors:
 - (a) Reviewed paper (Destination author).
 - (b) COMMENT SHEET (Destination author).
 - (c) Signed REVIEW CHECKLIST (Destination WDD).

7. DOCUMENTS

The following documents will be available on MULTICS and may be extracted from the directory

>udd>DEMS>NASA/RECON>NASA.working_paper_series

with the segment name

DEMS.NASA/RECON.STANDARD.archive

in NASA.working_paper_series.archive

DOCUMENT

-
- (1) INTRODUCTION
 - (2) ABSTRACT GUIDELINES
 - (3) PAPER OUTLINE
 - (4) PAPER FORMAT
 - (5) SUBMISSION POLICY
 - (6) REVIEWER GUIDE
 - (7) REVIEWER CHECKLIST
 - (8) COMMENT SHEET

REVIEWER NAME _____ DATE RECEIVED _____

AUTHOR NAME _____ DEADLINE DATE _____

REPORT NUMBER _____ DATE COMPLETED _____

VERSION NUMBER _____

TITLE _____

YES SOME NO

REMINDER

 REVIEWER CHECKS:

- [] [] [] 1: Were all references to other work read before reviewing the paper??
- [] [] [] 2: Was the paper THOROUGHLY reviewed??
- [] [] [] 3: Was feedback provided to the author via notes within the paper and attached comment sheet??
- [] [] [] 4: Did you understand the material presented??

PAPER CHECKS:

- [] [] [] 1: Were revisions made to the last version?? (if applicable)
- [] [] [] 2: Was the English language properly used?
- [] [] [] 3: Any misspelled words??
- [] [] [] 4: Does the organization of the paper follow paper format standards??
- [] [] [] 5: Are references to outside literature correctly cited??
- [] [] [] 6: Is the reference list complete and accurate??

- [] [] [] 7: Any obvious (or semi-obvious) plagiarism??
- [] [] [] 8: Any technical inconsistencies between writing and works cited??
- [] [] [] 9: Any technical inconsistencies within paper??
- [] [] [] 10: Are figures technically correct and adequately referenced??(if no, go to comment)
- [] [] [] 11: Are tables technically correct and accurately referenced??(if no, go to comment)
- [] [] [] 12: Were all references made available to you??
- [] [] [] 13: Can reference list be improved??
 (if yes, go to comments)
- [] [] [] 14: Any missing details?? (if yes, go to comments)
- [] [] [] 15: Any extra details?? (if yes, go to comments)
- [] [] [] 16: Is paper interesting??
 (if no, go to comments)
- [] [] [] 17: Are paper objectives defined and met??
 (if no, go to comments)
- [] [] [] 18: Is an introduction included??
- [] [] [] 19: Is the introduction adequate??
 (if no, go to comments)
- [] [] [] 20: Is a summary included?
- [] [] [] 21: Is the summary adequate??
 (if no, go to comments)
- [] [] [] 22: Is the content of the paper clearly presented?? (if no, go to comments)
- [] [] [] 23: Is the abstract sufficiently brief to meet specified length requirements??
 (100 to 250 words)

[] [] [] 24: Does the abstract present information not contained in the paper rather than merely describe what is in the paper?? (if yes, go to comments)

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WORKING PAPER SERIES

ATTACHMENT 4.2

"OVERVIEW OF THE NASA/RECON EDUCATIONAL,
RESEARCH AND DEVELOPMENT ACTIVITIES OF
THE COMPUTER SCIENCE DEPARTMENTS OF
THE UNIVERSITY OF SOUTHWESTERN LOUISIANA
AND SOUTHERN UNIVERSITY," WAYNE D. DOMINICK
USL/DBMS NASA/RECON WORKING PAPER SERIES
REPORT NUMBER DBMS.NASA/RECON-1.

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The USL/DBMS NASA/RECON Working Paper Series contains a collection of reports representing results of activities being conducted by the Computer Science Department of the University of Southwestern Louisiana pursuant to the specifications of National Aeronautics and Space Administration Contract Number NASW-3846. The work on this contract is being performed jointly by the University of Southwestern Louisiana and Southern University.

For more information, contact:

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USL/DBMS NASA/RECON Working Paper Series
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University of Southwestern Louisiana
P. O. Box 44330
Lafayette, Louisiana 70504
(318) 231-6308

| DBMS.NASA/RECON-1 |

| WORKING PAPER SERIES |

OVERVIEW OF THE NASA/RECON
EDUCATIONAL, RESEARCH, AND DEVELOPMENT ACTIVITIES
OF THE
COMPUTER SCIENCE DEPARTMENTS OF THE
UNIVERSITY OF SOUTHWESTERN LOUISIANA AND SOUTHERN UNIVERSITY

Wayne D. Dominick

Computer Science Department
University of Southwestern Louisiana
P. O. Box 44330
Lafayette, Louisiana 70504

Revised: February 29, 1984

This document presents a brief overview of the scope of activities being undertaken by the Computer Science Departments of the University of Southwestern Louisiana (USL), Lafayette, Louisiana and Southern University (SU), Baton Rouge, Louisiana pursuant to a contract with the National Aeronautics and Space Administration (NASA). This document will present only basic identification data concerning the contract activities since subsequent entries within this Working Paper Series will be oriented specifically toward a detailed development and presentation of plans, methodologies, and results of each contract activity.

This document also includes a table of contents of the entire USL/DBMS NASA/RECON Working Paper Series.

OVERVIEW OF SCOPE OF CONTRACT

CONTRACT TITLE

NASA RECON: Course Development, Administration, and
Evaluation

FUNDING AGENCY

National Aeronautics and Space Administration (NASA)

CONTRACTORS

University of Southwestern Louisiana (USL), Lafayette,
Louisiana. USL Principal Investigator: Wayne D. Dominick

Southern University (SU), Baton Rouge, Louisiana. SU
Principal Investigator: Leroy Roquemore

CONTRACT NUMBER

NASW-3846

CONTRACT AWARD DATE

December 8, 1983

EDUCATIONAL PROGRAM ORIENTATION

Very Large Scale Interactive IS&R Systems

Multiple Systems Orientation

Multiple Data Base Orientation

University Level Orientation

Scientific and Engineering Disciplines

Non-Computer Professional Audience

Extensive Hands-on Interactive System Usage

Fully Transportable Course Materials

EDUCATIONAL PROGRAM DEVELOPMENT, PILOT ADMINISTRATION, AND EVALUATION PHASES

Needs Analysis Phase

Course Development Phase

Pilot Course Administration Phase

Evaluation Phase

FOLLOW-ON PHASES

Develop "Marketing" Plan

Implement "Marketing" Plan

Conduct Regional Seminars

Conduct On-Site Seminars

Coordinate Request Processing / Dissemination

Perform Course State-of-the-Art Enhancements

Perform Institutional Surveys / Evaluations

Perform Graduated Student Surveys / Evaluations

Perform Additional System-Oriented and Data Base-Oriented
Enhancements

Perform Periodic Statistical Summary Reporting

DOCUMENT	NUMBER	DOCUMENT AUTHOR(S) / TITLE / DATE / PAGINATION
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DBMS.NASA/RECON-1		Dominick, Wayne D., "Overview of the NASA/RECON Educational, Research, and Development Activities of the Computer Science Departments of the University of Southwestern Louisiana and Southern University," Revised February 29, 1984, 9p.
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DBMS.NASA/RECON-2		Dominick, Wayne D. and Roquemore, Leroy, "NASA RECON: Course Development, Administration, and Evaluation," January 16, 1984, 65p.
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DBMS.NASA/RECON-3		Dominick, Wayne D. and Roquemore, Leroy, "Transportable, University-Level Educational Programs in Interactive Information Storage and Retrieval Systems," January 27, 1984, 16p.
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USL/DBMS NASA/RECON FUTURE WORKING PAPER SERIES INDEX

DOCUMENT	NUMBER	DOCUMENT AUTHOR(S) / TENTATIVE TITLE
DBMS.NASA/RECON-4	Granier, Martin,	"The Man/Machine Interface in Information Retrieval: Providing Access to the Casual User."
DBMS.NASA/RECON-5	Kavi, Srinu,	"Knowledge Based Systems: A Preliminary Survey of Selected Issues and Techniques."
DBMS.NASA/RECON-6	Liu, I-Hsiung,	"Concepts and Implementations of Natural Language Query Systems."
DBMS.NASA/RECON-7	Yu, Wei-Chung,	"Selected Database Security Technologies for Database Systems."
DBMS.NASA/RECON-8	Granier, Martin,	"Critical Comparative Analysis of the Major Commercial IS&R Systems."

DBMS.NASA/RECON-9 Kavi, Srinu, "Knowledge Based Systems: A
Critical Survey of the Major Issues and
Techniques."

ATTACHMENT 4.3

**"NASA/RECON: COURSE DEVELOPMENT,
ADMINISTRATION, AND EVALUATION,"
WAYNE D. DOMINICK AND LEROY ROQUEMORE,
USL/DBMS NASA/RECON WORKING PAPER SERIES
REPORT NUMBER DBMS.NASA/RECON-2.**

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| WORKING PAPER SERIES |

NASA RECON:
COURSE DEVELOPMENT, ADMINISTRATION, AND EVALUATION

A Research & Development Proposal

Submitted to:

The National Aeronautics and Space Administration

by

The University of Southwestern Louisiana
Computer Science Department
Lafayette, Louisiana

&

Southern University
Department of Computer Science
Baton Rouge, Louisiana

May 1983

NASA RECON:
COURSE DEVELOPMENT, ADMINISTRATION, AND EVALUATION

ABSTRACT

This research and development proposal addresses the development, administration, and evaluation of a set of transportable, college-level courses to educate science and engineering students in the effective use of automated scientific and technical information storage and retrieval systems, and, in particular, in the use of the NASA RECON system.

After a brief introduction to the research and development area in Chapter I, Chapter II identifies the general and specific objectives for this project, with objectives being categorized as needs analysis objectives, course development objectives, course administration objectives, and course evaluation objectives. Chapter III then proposes the methodology to be employed in successfully accomplishing these objectives; Chapter IV highlights the expected results and product deliverables of this project; and Chapter V presents the project evaluation plan to be followed in evaluating all activities and deliverables proposed within this project.

Chapter VI presents a brief overview of the institutional resources available at the proposing institutions, namely, at the University of Southwestern Louisiana and at Southern University, to support this project. Chapter VII presents the proposed project budget, time schedule, and project management plan for this project, and Chapter VIII summarizes the proposed project. Finally, resumes of the Co-Principal Investigators for this project are provided in the appendices to this proposal.

We believe this to be a sound and very timely research and development proposal whose results should be extremely beneficial within both current and future NASA scientific and technical information environments.

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I. INTRODUCTION

There appears to be a growing realization that recent college graduates in scientific and engineering disciplines do not have the experience, skills, and motivation necessary to take full advantage of existing, automated systems which provide capabilities for searching and retrieving scientific and technical information.

Massive data bases of bibliographic information are currently available and accessible via online, interactive systems. For example, the NASA RECON system provides such access to a variety of document series including, among others:

- * Scientific and Technical Aerospace Reports (STAR)
- * Limited Scientific and Technical Aerospace Reports (LSTAR)
- * International Aerospace Abstracts (IAA)
- * NASA Research and Technology Operating Plan Summary (RTOS)
- * Computer Program Abstracts (CPA)
- * NASA Library Collection.

This research and development proposal addresses the development, administration, and evaluation of a set of transportable, college-level courses to educate science and engineering students in the effective use of automated scientific and technical information storage and retrieval systems, and, in

particular, in the use of the NASA RECON system.

As a result of the successful completion of this project, we would expect that a number of highly significant benefits would accrue to NASA:

- (1) Graduate from colleges and universities sponsoring such courses would have gained the experience, skills, and motivation necessary for the effective use of automated research support systems and of the NASA RECON system in particular and hence would be readily suitable to work with NASA. Such prior experience should have a positive effect on the quality of research conducted by incoming NASA employees and should minimize required training time by NASA in such areas.
- (2) NASA's sponsorship of such courses should provide much greater visibility for NASA in colleges and universities where NASA would be likely to recruit.
- (3) Having research faculty in science and engineering at colleges and universities become familiar with RECON and with NASA bibliographic data bases should facilitate contract research between NASA and such colleges and universities.

In order to ensure the success of this project, this proposal is being submitted jointly by the University of Southwestern Louisiana (a university with a very strong, proven track record in Computer Science research and development, especially in the area of computer-based information system) and Southern University (a developing institution with serious interests in enhancing its research capabilities in Computer Science).

Based upon the historical support which the Computer Science Department at USL has provided to Southern University to expedite the development of Computer Science curricula, graduate programs, faculty capabilities, and research competencies at Southern University, this joint research and development proposal is felt to be in complete concert with the aims of the National Aeronautics and Space Administration with respect to support for developing institutions.

II. PROJECT OBJECTIVES

The intent of this chapter is to define the set of project objectives which will structure and direct all of the activities to be performed within the scope of this proposed project. Project objectives are first stated in general terms in Section 2.1 and then refined into specific project objectives in Section 2.2.

2.1 General Objectives

The general objectives identified for this proposed project are as follows:

- (1) General Needs Analysis Objective: The conduct of a thorough needs analysis to ascertain the specific needs of target scientific and engineering institutions with respect to the availability of transportable courses addressing automated scientific and technical information storage and retrieval systems, in particular, the NASA RECON system.
- (2) General Course Development Objective: The complete development of a set of transportable courses addressing automated scientific and technical information storage and

retrieval systems in accordance with institutional needs as identified within objective (1) above.

- (3) General Course Administration Objective: The pilot administration/teaching of the courses developed within objective (2) above on-site at the proposing institutions.
- (4) General Course Evaluation Objective: The comprehensive evaluation of each activity performed and each deliverable produced within the scope of this project.

2.2 Specific Objectives

The following four sub-sections of this chapter will define the specific project objectives for each of the four general project objectives identified within Section 2.1 above.

2.2.1 Needs Analysis Objectives

The specific project objectives associated with the General Needs Analysis Objective identified as general objective (1) in Section 2.1 are as follows:

- (1) Identify the target scientific and engineering institutions to be surveyed. It is expected that such institutions

represent current and possibly potential future users of RECON.

- (2) Develop a needs identification questionnaire to be administered at the identified target institutions.
- (3) Administer the needs identification questionnaire.
- (4) Summarize and analyze the questionnaire results and identify implications of needs analysis results to course development activities.
- (5) Prepare an interim report (Interim Report No. 1) summarizing the results of the Needs Analysis phase of the project and submit this report to the NASA contract monitor for review.

2.2.2 Course Development Objectives

The specific project objectives associated with the General Course Development Objective identified as general objective (2) in Section 2.1 are as follows:

- (1) Based on the results of the needs analysis phase of the project, determine specific details associated with course(s) design, content, and duration.

In light of potential diversity of needs across different institutions, it is expected that there may well be the need for developing a set of courses (rather than a single course). For example, there may well be the need for developing each of the following courses in an integrated manner:

- (a) A full semester course (approximately 18 weeks duration, 3 hours/week) addressing both the principles of interactive scientific and technical information storage and retrieval systems and integrating numerous examples utilizing RECON across a variety of scientific and engineering disciplines.
- (b) A mini course (approximately 6 weeks duration, 3 hours/week) highlighting selected search and retrieval principles and illustrating such principles utilizing RECON examples across selected scientific and engineering disciplines.
- (c) A brief, intensive workshop (1-2 day duration) presenting and illustrating the most important commands and capabilities of RECON.

Throughout the remainder of this proposal, it will be assumed that an integrated set of courses similar to those presented above will need to be developed.

(2) Complete development of all transportable course materials for the integrated set of courses identified within objective (1) above. For each such course, this will require development of the following materials:

- (a) Course syllabus.
- (b) Course lesson plans.
- (c) RECON homework assignments.
- (d) RECON homework assignments - answer keys.
- (e) RECON usage assignments.
- (f) RECON usage assignments - answer keys.
- (g) Course examinations.
- (h) Course examinations - answer keys.
- (i) Course visuals (transparencies).

(3) Prepare an interim report (Interim Report No. 2) summarizing the results and deliverables of the Course Development phase of the project and submit this report to the NASA contract monitor for review.

2.2.3 Course Administration Objectives

The specific project objectives associated with the General Course Administration Objective identified as general objective (3) in Section 2.1 are as follows:

- (1) Perform all required university administrative protocol functions associated with the offering of new courses, e.g., prepare course descriptions and announcements, coordinate course scheduling and facility reservations, perform prospective student advisement, and the like.
- (2) Perform all activities associated with the actual teaching of the courses, e.g., lecturing, RECON demonstrations, grading assignments and examinations, maintaining course office hours, advising students, scheduling special sessions and RECON demonstrations as required, and the like.
- (3) Prepare an interim report (Interim Report No. 3) summarizing the results and deliverables of the Course Administration phase of the project and submit this report to the NASA contract monitor for review. Depending on the scheduling of the offerings of the different courses, there may well be a series of Interim Report No. 3 documents, with each document corresponding to one offering of a course.

2.2.4 Course Evaluation Objectives

The specific project objectives associated with the General Course Evaluation Objective identified as general objective (4) in Section 2.1 are as follows:

- (1) Perform a comprehensive evaluation of the activities, results, and deliverables associated with the Needs Analysis phase of the project. This evaluation will be incorporated within Interim Report No. 1 as referenced within Section 2.2.1.
- (2) Perform a comprehensive evaluation of the activities, results, and deliverables associated with the Course Development phase of the project. This evaluation will be incorporated within Interim Report No. 2 as referenced within Section 2.2.2.
- (3) Perform a comprehensive evaluation of the activities, results, and deliverables associated with the Course Administration phase of the project. This evaluation will be incorporated within Interim Report No. 3 as referenced within Section 2.2.3.
- (4) Perform a comprehensive evaluation of the activities, results, and deliverables associated with the project in its entirety. Together with a summary of all such activities, results, and deliverables, this final comprehensive evaluation will constitute the Final Report of the project.

As an expansion of these evaluation objectives, Chapter V presents the proposed project evaluation plan.

III. PROPOSED PROJECT METHODOLOGY

In the interests of brevity, this chapter will address only selected components of the proposed methodology for this project.

In particular, since the needs analysis phase of this project (see Section 2.2.1, entitled "Needs Analysis Objectives") will utilize standard needs analysis and survey questionnaire techniques, no additional discussion of methodology for that phase will be presented in this chapter. Additionally, since the course administration phase of this project (see Section 2.2.3, entitled "Course Administration Objectives") will parallel contemporary teaching/administrative techniques for courses providing hands-on experience with online, interactive information systems, again, no additional discussion of methodology for that phase will be presented in this chapter. Finally, since the course evaluation phase of this project (see Section 2.2.4, entitled "Course Evaluation Objectives") will be addressed within Chapter V, entitled "Project Evaluation Plan", no additional discussion of methodology for that phase will be presented in this chapter.

This chapter will, thus, focus on selected components of the course development phase of this project (see Section 2.2.2,

entitled "Course Development Objectives).

The primary objective of the course development phase is the complete development of all transportable course materials for the integrated set of courses to be developed (again, see Section 2.2.2 for an identification of the expected set of courses to be developed).

Within this context, a set of standardized course material documentation templates will be employed in order to ensure standardization between the proposing institutions during course development and administration, and in order to ensure transportability of all course deliverables to other institutions. This methodological approach has proven eminently successful in previously funded work of the USL Co-Principal Investigator on this project in similar environments, in particular, in Department of Defense funded work in the area of transportable college-level course development.

Standardized course material documentation templates will be utilized across all of the following course materials:

- (a) Course syllabus.
- (b) Course lesson plans.
- (c) RECON homework assignments.
- (d) RECON homework assignments - answer keys.
- (e) RECON usage assignments.
- (f) RECON usage assignments - answer keys.
- (g) Course examinations.
- (h) Course examinations - answer keys.
- (i) Course visuals (transparencies).

Examples of these standardized course material documentation templates can be found in Appendix C of this proposal.

IV. EXPECTED PROJECT RESULTS AND DELIVERABLES

The expected results and deliverables of this project correspond to the expected successful completion of each of the specific project objectives identified within Sections 2.2.1 through 2.2.4 of this proposal. Since those objectives were described in substantial detail, this chapter will merely present a brief highlighting of the major deliverables that should result from the successful completion of those objectives. These are as follows:

- (1) RECON course needs identification questionnaire. With minor modifications, this questionnaire should be transportable to other NASA system needs analysis surveys.
- (2) Summary and analysis of RECON course needs analysis survey.
- (3) Complete transportable course materials for an integrated set of information system / NASA RECON courses, including standardized:
 - (a) Course syllabus.
 - (b) Course lesson plans.
 - (c) RECON homework assignments.
 - (d) RECON homework assignments - answer keys.
 - (e) RECON usage assignments.
 - (f) RECON usage assignments - answer keys.
 - (g) Course examinations.
 - (h) Course examinations - answer keys.
 - (i) Course visuals (transparencies).

- (4) Results of the experience of the pilot administration / teaching of each of these courses at multiple institutions.
- (5) Comprehensive evaluations of each project activity.
- (6) Comprehensive documentation of each project activity utilizing standardized and transportable documentation templates.

It is felt that this collection of expected project deliverables (and, in particular, the validated transportability of these deliverables across the two proposing institutions) will be of very significant benefit both to NASA and to the current and potential future NASA RECON user community.

V. PROJECT EVALUATION PLAN

It is our intent to conduct a thorough evaluation of each component of this proposed project. Our evaluation plan consists of a layered, multi-level evaluation philosophy wherein each activity within each project phase would be evaluated at least at activity completion time and, for major activities of substantial duration, also at appropriate break points within the activity; wherein each phase would be evaluated in its entirety at phase completion time as an integration of activity-level evaluations; and wherein the total project would be evaluated in its entirety at project completion time as a summarative integration of phase-level evaluations.

Throughout the entire project, evaluation results will be provided to the NASA contract monitor as they are available in a series of project interim reports and the project final report (see Chapter II for proposed contents and timing of such reports).

It is felt that the specificity provided within the identified specific objectives for each project phase (Needs Analysis: Section 2.2.1; Course Development: Section 2.2.2; Course Administration: Section 2.2.3; and Course Evaluation:

Section 2.2.4) will serve as an excellent baseline for the project evaluation plan. In fact, our evaluations will focus on evaluating our success in achieving each stated objective and on evaluating the transportability and generalizability of each of the deliverables resulting from these objectives.

One of the excellent advantages of this multi-institutional proposal (involving both the University of Southwestern Louisiana and Southern University) is that all of the project results and deliverables are guaranteed to be transportable between at least two institutions (for, if they are not, we would have failed miserably). Since there are many differences between these two proposing institutions, we must certainly develop all project products in a generalized and transportable manner from the very onset of the project. With this motivation, we fully expect that all of the deliverables that we produce as a result of this project work will be completely transportable to any college or university that currently has, or can be provided with access to the RECON system.

Based on the large number of funded grant and/or contract research projects that have been directed, either individually or jointly by the proposed Co-Principal Investigators for this project, we feel completely confident in the expected quality of our final deliverables and in our ability to thoroughly evaluate such deliverables.

VI. OVERVIEW OF INSTITUTIONAL RESOURCES

This chapter will present a very brief overview of the institutional resources and/or environments available at the proposing institutions and relevant to the scope of the proposed project. For the purposes of this proposal, information will be presented only in the following three areas: (1) Computer Science Department programs, students, and research activities; (2) University and Computer Science Department computing facilities; and (3) University science and engineering programs. Overview information will be presented for both the University of Southwestern Louisiana (USL) and Southern University (SU).

USL = Computer Science Department Programs, Students, and Research Activities

The Computer Science Department at USL offers degree programs at the B.S., M.S., and Ph.D. levels. Students majoring in Computer Science within the Department during the 1982-83 academic year included 1,012 majors at the B.S. level; 113 majors at the M.S. level; and 46 majors at the Ph.D. level.

The Department is extremely active in advanced research and development activities, having received numerous research grants from organizations such as the National Science Foundation, the

National Aeronautics and Space Administration, the Army Research Office, the Army Corps of Engineers, the Office of Naval Research, the North Atlantic Treaty Organization, Texas Instruments, and many others. All R&D activities in the information systems area are coordinated through the DBMS (Data Base Management System) Project, a large-scale R&D project founded in October, 1975 by the USL Co-Principal Investigator for this proposed project, and administered under the auspices of the Computer Science Department at USL.

USL - University and Computer Science Department Computing Facilities

The major University computing facility consists of a three processor Honeywell 68/80 MULTICS system with twelve megabytes of main memory. This is one of the most powerful and sophisticated contemporary time-sharing systems available. The Computer Science Department maintains a Departmental computer laboratory consisting of a variety of minicomputer and microcomputer systems. Additionally, the Department has recently received approval for the acquisition of two DEC VAX 11/780 systems, scheduled for installation in August, 1983.

USL - University Science and Engineering Programs

University programs in science and engineering are administered under the auspices of the College of Biological, Mathematical and Physical Science and the College of Engineering, respectively.

The College of Biological, Mathematical and Physical Sciences is comprised of the following Departments: Biology, Chemistry, Computer Science, Mathematics and Statistics, Microbiology, and Physics. The College of Engineering is comprised of the following Departments: Chemical Engineering, Civil Engineering, Electrical and Computer Engineering, Geology, Mechanical Engineering, and Petroleum Engineering. With the exception of the Departments of Biology and Microbiology, the B.S. curricula for all of the above departments already require at least one course in Computer Science.

SU - Computer Science Department Programs, Students, and Research Activities

The Department of Computer Science at SU offers the B.S. Degree, with 350 majors during the 1982-83 academic year. Additionally, the Department has received approval to initiate an M.S. Degree program starting with the Fall Semester, 1983.

The Department has maintained a moderate program of research during its 15 year history, including research grants received from the National Aeronautics and Space Administration, Raytheon Data Systems Company, Proctor and Gamble, and Bell Laboratories. In addition, some teachers conduct unfunded research projects.

SU = University and Computer Science Department Computing Facilities

The major University computing facility consists of an IBM 4341 system with four megabytes of main memory which supports both batch and interactive environments for its users. The Department of Computer Science administers two computing laboratories, with a Raytheon Data Systems Programmable Terminal System 1200 (PTS/1200) minicomputer with 128 kilobytes of main memory in one laboratory, and a Burroughs Corporation B1855 computer system with 512 kilobytes of main memory in the other laboratory. There are currently two microcomputers in the Department, with eight additional ones scheduled to be delivered June 1, 1983.

SU = University Science and Engineering Programs

University programs in science and engineering are administered by the College of Sciences and the College of Engineering, respectively. The College of Sciences is comprised

of the Departments of: Biology, Chemistry, Computer Science, Geography, Health Research, Mathematics, Physics, Psychology, Sociology, and Speech Pathology and Audiology. The College of Engineering is comprised of the Division of Technology and the Departments of: Architecture, Civil Engineering, Electrical Engineering, and Mechanical Engineering. Beginning with the Fall Semester, 1983, all areas referenced above will require a minimum of one course in Computer Science.

VII. PROPOSED PROJECT BUDGET,
TIME SCHEDULE, AND PROJECT MANAGEMENT PLAN

The following three sub-sections of this chapter present respectively the proposed project budget, the proposed project time schedule, and the proposed project management plan.

7.1 Budget

The budget for the proposed project is presented on page 30. Various notes to the budget are explained below.

SALARIES AND WAGES:

Senior Personnel:

Wayne D. Dominick: \$4583/mo. (12 months at 40% time).
Leroy Roquemore: \$3789/mo. (12 months at 40% time).
(Salary increases of 15% for Year 2 are included.)

Other Professional Personnel:

USL Research Assistants: 2 at \$7200/yr.
SU Research Assistants: 2 at \$5600/yr.
(Salary increases of 10% for Year 2 are included.)

Non-Professional Personnel:

Secretarial-Clerical: 1/4-time at each institution at
\$10000/yr.
(Salary increases of 10% for Year 2 are included.)

STAFF BENEFITS:

Staff benefit rate at USL is 11.3% of salaries and wages.
Staff benefit rate at SU is 13.0% of salaries and wages.

INDIRECT COSTS:

Indirect cost rate at USL is 47% of salaries and wages.
Indirect cost rate at SU is 45% of salaries and wages.

EXPENDABLE MATERIALS AND SUPPLIES:

Transparencies, terminal paper and ribbons, paper, etc.

TRAVEL:

Trips to NASA, Washington, D.C.:

6 person trips in Year 1 (3 each institution); 4 trips to attend RECON training sessions; 2 trips to present Year 1 reports to NASA. 4 person trips in Year 2 (2 each institution) to present Year 2 interim report and project final report to NASA. Travel at \$725/trip (air fare, motel (2 days), meals, taxi, etc.).

Trips Between Proposing Institutions:

24 person trips per year (12 each institution); 1 per month per institution. Travel at \$50/trip (car mileage, meals).

COMPUTER/COMMUNICATIONS COSTS:

Computer Terminals Purchase:

6 HP 2621B terminals (3 each institution) for RECON usage. Purchase price of \$2855/terminal. All terminal purchases will occur in Year 1.

Computer Terminal Maintenance:

Maintenance on 6 terminals (3 each institution) at \$32/mo. for 5 months during Year 1 and 12 months during Year 2.

Modem Lease Costs:

2 modems (1 each institution) at \$40/mo. lease for 5 months during Year 1 and 12 months during Year 2.

Cabling: Modems to Terminals:

6 terminals (3 each institution); \$70/terminal for cabling. One-time charge in Year 1.

Connect Time/Line Charges:

Year 1 will require 100 hours development time (50 hours each institution) and 44 hours instructional time for conduct of RECON workshops at each institution (22 hours each institution); total of 144 hours connect time/line charges in Year 1. Year 2 will require 1100 hours instructional time for conduct of RECON 6-week course and RECON 18-week course at each institution (550 hours each institution). Charge rates for components of connect time/line charges are as follows:

- * NASA Host System Connect Time: \$20/hr.
- * TELENET Line Charges: \$7/hr.
- * Telephone to TELENET Node Charges: \$20.21/hr
(for Band 5 WATS Line)

Local Word processing Costs:

Document preparation at each institution.

OTHER DIRECT COSTS:

Telephone:

Verbal communication between institutions and to NASA.

Photocopying/Postage:

Written communication between institutions and to NASA.

B U D G E T

	Y E A R 1 10/01/83 - 09/30/84			Y E A R 2 10/01/84 - 09/30/85			T O T A L 10/01/83 - 09/30/85		
	USL	SU	TOTAL	USL	SU	TOTAL	USL	SU	TOTAL
SALARIES AND WAGES:									
Senior Personnel:									
Wayne D. Dominick	21998			25298			47296		
Leroy Roquemore		18187	40185		20915	46213		39102	86398
Other Professional Personnel:									
Research Assistants (4)	14400	11200	25600	15840	12320	28160	30240	23520	53760
Non-Professional Personnel:									
Secretarial-Clerical	2500	2500	5000	2750	2750	5500	5250	5250	10500
Total Salaries and Wages	38898	31887	70785	43888	35985	79873	82786	67872	150658
STAFF BENEFITS:									
USL: 11.3%									
SU : 13.0%	4395	4145	8540	4959	4678	9637	9354	8823	18177
TOTAL SALARIES, WAGES AND STAFF BENEFITS	43293	36032	79325	48847	40663	89510	92140	76695	168835
INDIRECT COSTS:									
USL: 47%									
SU : 45%	18282	14349	32631	20627	16193	36820	38909	30542	69451
EXPENDABLE MATERIALS AND SUPPLIES	1000	1000	2000	1500	1500	3000	2500	2500	5000
TRAVEL:									
Trips to NASA	2175	2175	4350	1450	1450	2900	3625	3625	7250
Trips Between Proposing Institutions	600	600	1200	600	600	1200	1200	1200	2400
Total Travel	2775	2775	5550	2050	2050	4100	4825	4825	9650
COMPUTER/COMMUNICATIONS COSTS:									
Computer Terminals Purchase	8565	8565	17130	0	0	0	8565	8565	17130
Computer Terminal Maintenance	480	480	960	1152	1152	2304	1632	1632	3264
Modem Lease Cost	200	200	400	480	480	960	680	680	1360
Cabling: Modems to Terminals	210	210	420	0	0	0	210	210	420
NASA Host System Connect Time	1440	1440	2880	11000	11000	22000	12440	12440	24880
TELENET Line Charges	504	504	1008	3850	3850	7700	4354	4354	8708
Telephone to TELENET Nodes	1455	1455	2910	11116	11116	22232	12571	12571	25142
Local Word Processing Costs	1000	1000	2000	1000	1000	2000	2000	2000	4000
Total Computer/Communications	13854	13854	27708	28598	28598	57196	42452	42452	84904
OTHER DIRECT COSTS:									
Telephone	500	500	1000	500	500	1000	1000	1000	2000
Photocopying/Postage	500	500	1000	1000	1000	2000	1500	1500	3000
Total Other Direct Costs	1000	1000	2000	1500	1500	3000	2500	2500	5000
TOTAL PROJECT COSTS	80204	69010	149214	103122	90504	193626	183326	159514	342840

7.2 Time Schedule

The time schedule for the proposed project is presented on page 32.

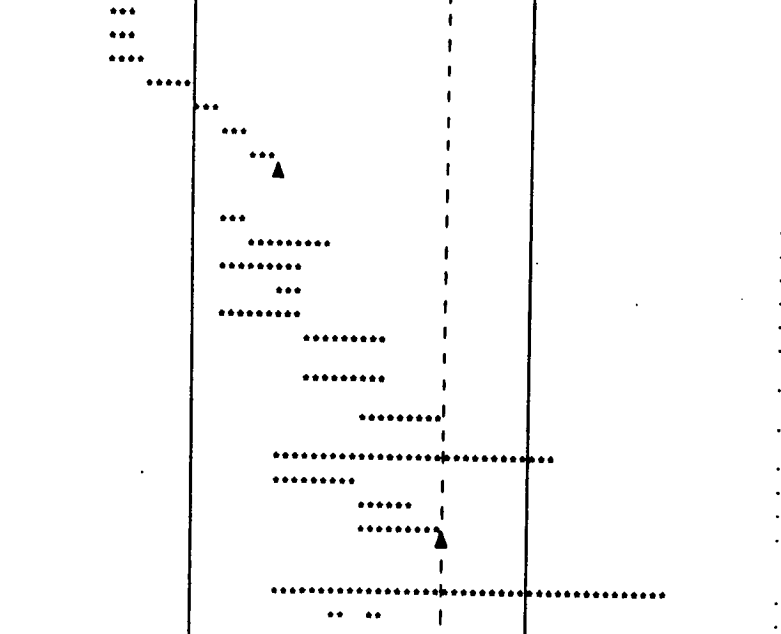
As illustrated in the time scheduling diagram, this project is proposed to span a period of two years, with an October 1, 1983 start date and a September 30, 1985 completion date.

Within the scheduling diagram, great care has been exerted to ensure that the scheduling of each project phase appropriately coincides with typical university academic year and semester periods in order to ensure compatibility of the proposed work with previously established university teaching schedules.

The diagram also illustrates the timing of the preparation and submission of the project interim reports and the project final report. Interim Report No. 1 occurs at the end of the sixth month and Interim Report No. 2, occurring at the end of the twelvth month, will also serve as the end of year 1 report. Interim Report No. 3 occurs at the end of the Course Administration Phase, and the final report occurs at the end of the twenty-fourth month.

TIME SCHEDULE

YEAR	1983												1984												1985											
MONTH	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S												
MONTH #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24												



LEGEND

R/WK = RECON Workshops
R/6 = RECON 6-week Course
R/18 = RECON 18-week Course

7.3 Project Management Plan

The Co-Principal Investigators will assume both joint project-level responsibilities and individual institutional-level responsibilities.

From the standpoint of overall project management, the Co-Principal Investigator responsibilities will include overall project-level planning, control, monitoring of progress toward defined plans/schedules, budget administration, and coordination and integration of all institutional-level activities and deliverables. They will also be jointly responsible for the evaluation of all project methodologies and results, for the preparation of all interim reports and the final project report, and for all coordination with the funding agency.

From the standpoint of institutional-level project management, each Co-Principal Investigator will assume complete responsibility for the conduct of each project task at his respective institution. Each will also assume responsibility for ensuring that all of the tasks performed at his institution are completed in accordance with defined project-level standards concerning generalizability and transportability. Additionally,

each will serve as a project consultant to the other to assist in resolving any difficulties that may occur at one institution or the other.

In light of the developing nature of Southern University with respect to Computer Science research and development and the strong and proven expertise of the University of Southwestern Louisiana in such activities, it is felt that this joint project management plan is essential in order to ensure the success of this project.

VIII. SUMMARY OF PROPOSED PROJECT

This research and development proposal has addressed the development, administration, and evaluation of a set of transportable, college-level courses to educate science and engineering students in the effective use of automated scientific and technical information storage and retrieval systems, and, in particular, in the use of the NASA RECON system.

After a brief introduction to the research and development area in Chapter I, Chapter II identified the general and specific objectives for this project, with objectives being categorized as needs analysis objectives, course development objectives, course administration objectives, and course evaluation objectives. This collection of objectives is felt to represent an excellent structure and framework for the conduct of the proposed project.

Chapter III then outlined the proposed methodology to be employed in successfully accomplishing these objectives. Based on the success of numerous past and present joint grant activities between the proposing Co-Principal Investigators, this methodology is believed to be sound, realistic, and achievable within the scope of this project.

Chapter IV highlighted the expected project results and product deliverables associated with the completion of this project, and Chapter V presented the evaluation plan to be followed in order to ensure a comprehensive evaluation of all activities and deliverables proposed within the scope of the project.

Chapter VI presented a very brief overview of the institutional resources available at the proposing institutions to support this project. It is felt that these resources are more than adequate to provide an effective environment for the successful conduct of the proposed activities.

Chapter VII presented the proposed project budget, time schedule, and project management plan. Based on the magnitude of the activities and deliverables comprising this proposed project, it is felt that both the budgetary and the scheduling figures presented are most realistic.

Finally, resumes of the Co-Principal Investigators for this project are provided in the appendices to this proposal.

Both the University of Southwestern Louisiana and Southern University look forward to a favorable review of this proposal and to providing these services to the National Aeronautics and Space Administration.

N A S A

01/16/84

Resume

Wayne D. Dominick

03/83

Mailing Address

University of Southwestern Louisiana
Computer Science Department
P. O. Box 44330
Lafayette, Louisiana 70504
(318) 231-6604

Personal Statistics

United States Citizen
Birthdate : 19 October 1946
Birthplace: Chicago, Illinois

Position

Associate Professor of Computer Science, University of
Southwestern Louisiana, 1977-present.

Research & Development Interests

Planning and administration of information system environments
Management information system design
Data base management system design
Information storage and retrieval system design
Software monitoring and system performance evaluation
User/system interfacing
Interactive graphics for data base systems.

Education

B.S., Mathematics, Illinois Institute of Technology, 1968.
M.S., Computer Science, Northwestern University, 1974.
Ph.D., Computer Science, Northwestern University, 1975.

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Wayne D. Dominick (Continued)

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Other Professional Experience

Long Range Planning Consultant, Offices of Planning & Research, OCLC, Inc., Dublin, Oh., 1982-present.

Member and program/curriculum consultant, Graduate Program Advisory Council, Department of Computer Science, Southern University, Baton Rouge, La., 1982-present.

President, Executive Systems, Incorporated, Lafayette, La., 1981-present.

Computer systems performance measurement and evaluation consultant, Computer Systems Engineering Department, OCLC, Inc., Dublin, Oh., 1980-present.

Data base technology consultant, Tenneco Oil Exploration and Production, Houston, Texas, 1980-1981.

Information systems planning and development consultant, Development Division, OCLC, Inc., Dublin, Oh., 1980-present.

Computer assisted instruction consultant, College of Sciences, Southern University, Baton Rouge, La. (NSF Minority Institutions Science Improvement Program: Individualized Institutional Project Grant), 1980-present.

Reviewer, Annual Review of Information Science and Technology, 1980-present.

Scientific Services Program (STAS) consultant, Directorate of Training Development, U. S. Army Signal Center & Fort Gordon, Fort Gordon, Ga., (administered through Battelle Columbus Laboratories), 1979-1981.

Vice-President, Optimum Information Systems, Inc., Columbus, Oh., 1979-present.

Management information system consultant, State of Louisiana, Department of Education, Office of Research & Development, Baton Rouge, La., 1978-present.

Vice-President/Secretary, Information Management, Inc., Lafayette, La., 1978-present.

Member, Special Interest Group Steering Committee, ASIS, 1978-1979.

Information system monitoring consultant, Office of Research (formerly Research Department), OCLC, Inc., Dublin, Oh., 1978-present.

Grant Proposal Reviewer, National Science Foundation, Washington, D. C., 1978-present.

Book Reviewer, Journal of the American Society for Information Science, ASIS, 1978-present.

Chairman, Special Interest Group on Numeric Data Bases, ASIS, 1977-1978.

Chairman, Graduate Studies Committee, Computer Science

Wayne D. Dominick (Continued)

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Department, University of Southwestern Louisiana, 1977-1979.
Member, Executive Committee, Computer Science Department,
University of Southwestern Louisiana, 1977-1982.
Assistant Professor of Computer Science, University of
Southwestern Louisiana, 1975-1977.
Chairman-elect, Special Interest Group on Numeric Data Bases,
ASIS, 1976-1977.
Newsletter editor, Special Interest Group on Numeric Data
Bases, ASIS, 1976-1977.
Speaker, USL Speakers Bureau, University of Southwestern
Louisiana, Lafayette, Louisiana, 1976-1981.
Data base system consultant, CODATA Task Group on Computer Use,
1976-present.
Curriculum and data base system consultant, Department of
Computer Science, Southern University, Baton Rouge, La. (HEW
Advanced Institutional Development Program Grant), 1976-1981.
Data base system consultant, Battelle Columbus Laboratories,
Columbus, Ohio, 1976-1977.
Data base management system and information storage and
retrieval system publications reviewer for major Computer
Science conferences, 1976-present.
Computer Science manuscript reviewer, Allyn and Bacon, Inc.,
Boston, Ma., 1976-present.
Founder and Director of the DBMS (Data Base Management System)
Project, University of Southwestern Louisiana, Lafayette,
La., 1975-present.
Energy Management Program Consultant, State of Louisiana,
Department of Conservation, Natural Resources and Energy
Division, Baton Rouge, La., 1975-1977.
U. S. Army Corps of Engineers Consultant, Champaign, Ill.,
Washington, D.C. and Vicksburg, Miss., 1975-1977.
Data base system consultant, Vogelback Computing Center,
Northwestern University, Evanston, Ill., 1975-1977.
Private consultant for management information system design,
Evanston, Ill. and Lafayette, La., 1971-present.
Royal E. Cabell Fellow, Department of Computer Science,
Northwestern University, Evanston, Ill., 1974-1975.
Information services programmer, Vogelback Computing Center,
Northwestern University, Evanston, Ill., 1971-1975.
Systems Analyst, U. S. Army Personnel Information Systems
Command, The Pentagon, Washington, D.C., 1969-1970.
Programmer, Department of Mathematics, Illinois Institute of
Technology, Chicago, Ill., 1967-1968.

Wayne D. Dominick (Continued)
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-----Professional Societies

American Society for Information Science (ASIS)
Special Interest Group on Numeric Data Bases (SIGNDB)
Special Interest Group on User On-Line Interaction (SIGUOI)
Special Interest Group on Education for Information Science
(SIGNED)
Association for Computing Machinery (ACM)
Special Interest Group on Management of Data (SIGMOD)
Special Interest Group on Information Retrieval (SIGIR)
Special Interest Group on Graphics (SIGGRAPH)
Special Interest Group on Measurement and Evaluation
(SIGMETRICS)
Human Factors Society (HFS)
Computer Systems Group (CSG)

Publications

"Developing Monitoring Techniques for an On-Line Information Retrieval System," (with B. Mittman), Information Storage and Retrieval: Theory and Practice, Vol. 9, No. 6, June, 1973, pp. 297-307.

"Interactive Graphics Enhancements for Information Retrieval Systems," (with B. Mittman), Proc. ACM, 1973 Annual Conference, 1973, p. 434.

"Information Retrieval System Cost/Performance Analysis via Interactive Graphics," (with B. Mittman), Proc. ASIS, Vol. 10, 1973 Annual Meeting, 1973.

RIQS - (Remote Information Query System) Feature Analysis, Technical Report, Vogelback Computing Center, Northwestern University, Evanston, Ill., April, 1973, 45p.

RIQS - Remote Information Query System Users Manual, (with L. Borman, R. Chalice, D. Dillaman, P. Kron), Technical Report, Vogelback Computing Center, Northwestern University, Evanston, Illinois, July, 1975, 262p.

The Man/Machine Interface, System Monitoring and Performance Evaluation Methodology for On-Line Interactive Systems, M.S. Thesis, Department of Computer Science, Northwestern University, Evanston, Illinois, June, 1974, 98p.

Wayne D. Dominick (Continued)

03/83

The RIQSONLINE Monitor and RIQSLOG Data Analysis Project, (with R. Witt), Technical Report, Vogelback Computing Center, Northwestern University, Evanston, Illinois, August, 1974, 38p.

The RIQSONLINE Procedure Processing Capability, Technical Report, Vogelback Computing Center, Northwestern University, Evanston, Illinois, August, 1974, 14p.

The RIQSONLINE Interactive Graphics Package, Technical Report, Vogelback Computing Center, Northwestern University, Evanston, Illinois, August, 1974, 9p.

RIQSTUTOR - A CAI Tutorial for RIQSONLINE, Technical Report, Vogelback Computing Center, Northwestern University, Evanston, Illinois, August, 1974, 5p.

"Administrative Data Management in a University Environment," (with D. Mintzer), Personalized Data Base Systems, B. Mittman, L. Borman (editors), John Wiley & Sons, Inc., 1975, Chapter 9, pp. 169-185.

"System Performance Evaluation of Interactive Retrieval," in Personalized Data Base Systems, B. Mittman, L. Borman (editors), John Wiley & Sons, Inc., 1975, Chapter 12, pp. 216-227.

"Selective Retrieval, Statistical and Interactive Graphical Analysis of Skin Biopsy Data," (with F. Levit), Personalized Data Base Systems, B. Mittman, L. Borman (editors), John Wiley & Sons, Inc., 1975, Chapter 15, pp. 251-263.

Models for Graphically-Enhanced Data Base Management System Design, Ph.D. Dissertation, Department of Computer Science, Northwestern University, Evanston, Illinois, June, 1975, 214p.

"Personalized Management and Graphical Display of Data: An Extensible System Approach," (with L. Borman, R. Hay, Jr., P. Kron, B. Mittman), Proceedings of the Workshop on Data Bases for Interactive Design, Waterloo, Ontario, Canada, September, 1975, pp. 36-44.

Wayne D. Dominick (Continued)

03/83

"The DBMS Project - Interdisciplinary Research in Data Base Management Systems," Proceedings 1976 Meeting of the Louisiana Academy of Sciences, February 5-7, 1976, Baton Rouge, La.

"A Methodology for Designing Graphically-Enhanced Data Base Management Systems," Proceedings 1976 Meeting of the Louisiana Academy of Sciences, February 5-7, 1976, Baton Rouge, La.

"Automated Aids for Managing and Evaluating a Data Base System Environment," (with M. H. McKinney), Proceedings of the Fifth Biennial International CODATA Conference, University of Colorado, Boulder, Co., June 28 - July 1, 1976, pp. 497-499.

"User/System Interfacing in an Interactive Retrieval, Statistical and Graphical Analysis Environment," (with Lorraine Borman), Proceedings of the Fifth Mid-Year Meeting of the American Society for Information Science, May 20-22, 1976, pp. 34-49.

"I Speak as an Information Professional," ASIS Career Profile Contest winning paper presented at the Fifth Mid-Year Meeting of the American Society for Information Science, Vanderbilt University, Nashville, Tenn., May 20-22, 1976, 26p.

Evaluation of RIQS - Remote Information Query System, Technical Report CMPS-76-6-1, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, April, 1976, 44p.

Relational Data Base Management: Design Concepts and a Prototype System, (with Daniel W. Pipkins), Technical Report CMPS-76-6-2, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, May, 1976, 62p.

RDBMS - Relational Data Base Management System Users Manual, (with Daniel W. Pipkins), Technical Report CMPS-76-6-3, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, May, 1976, 24p.

Wayne D. Dominick (Continued)

03/83

CIS - Conference Information System Design Concepts, (with Ginger M. Chauvin and Christie D. Parker), Technical Report CMPS-76-6-4, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, May, 1976, Revision 1, May 1977, 87p.

Query Complexity in Data Base Management Systems, (with Charles R. Carmichael), Technical Report CMPS-76-6-5, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, May, 1976, 54p.

An Overview of DBMS Research: System Design, Monitoring and Evaluation, (with Sharad K. Agarwal), Technical Report CMPS-76-6-6, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, June, 1976, 77p.

Extensible Interfacing of Generalized Data Base Management and Graphics, Technical Report CMPS-76-6-7, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, Sept, 1976, 33p.

"The User Interface to Numeric Data Bases," Proc. ASIS, 1976 Annual Meeting, Vol. 13, 1976, p. 70.

Personalized Interfaces Among Users, Information Systems and Graphics Processing, Technical Report CMPS-76-6-8, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, November, 1976, 19p.

COMPAK: A General-Purpose Data Compression Package, (with Boris R. Bosch and Yeou L. Lin), Technical Report CMPS-76-6-9, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, December, 1976, 92p.

"Information Specification Processing by Use of Iterative Inference From a Meta-Base," (with Thomas Cousins and M. H. McKinney), Summary in Proceedings of the Tenth Hawaii International Conference on Systems Sciences, Honolulu, Hawaii, January 5-7, 1977, pp. 92-94; Paper in Selected Papers in Management Information Systems, Tenth Hawaii International Conference on Systems Sciences Supplement, pp. 10-15.

Wayne D. Dominick (Continued)
-----03/83

"Graphics Support for Data Base Management Systems," (with James R. Lee), Proceedings of the 1977 ACM Computer Science Conference, January 31 - February 2, 1977, p. 27.

"Optimizing and Evaluating Data Base Structuring on MULTICS," (with Glenn A. Shaffer and Sharad K. Agarwal), Proceedings of the 1977 ACM Computer Science Conference, January 31 - February 2, 1977, p. 23.

MADAM: Multics Approach to Data Access and Management Users Guide, (with Sharad K. Agarwal), Technical Report CMPS-77-6-1, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, January, 1977, 90p.

"Design and Implementation Considerations for Monitoring and Evaluating Information Systems," (with Joseph E. Urban), Proceedings of the 15th Annual Southeastern Regional ACM Conference, April 18-20, 1977, pp. 356-370.

"MADAM: Multics Approach to Data Access and Management," (with Sharad K. Agarwal), Proceedings of the 15th Annual Southeastern Regional ACM Conference, April 18-20, 1977, pp. 182-195.

A Relational and Network Database Access Language, (with Donald J. Simon and M. H. McKinney), Technical Report CMPS-77-6-2, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, May, 1977, 18p.

Preliminary Analyses of MADAM Versions 1-5, (with Howard G. Berg, Sharad K. Agarwal and Joseph E. Urban), Technical Report CMPS-77-6-3, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, May, 1977, 116p.

A Medical Records System: Foundations, Design and Implementation, (with Steven D. Higgins and Glenn A. Shaffer), Technical Report CMPS-77-6-4, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, May, 1977, 57p.

Wayne D. Dominick (Continued)

03/83

"Numeric Data Base Systems: Concepts and Capabilities,"
Collection of Papers of the Sixth Mid-Year Meeting of the
American Society for Information Science, May 19-21, 1977,
pp. 55-60.

Multiple Data Base Support for MADAM, (with Glenn A. Shaffer),
Technical Report CMPS-77-6-5, Computer Science Department,
University of Southwestern Louisiana, Lafayette, Louisiana,
June, 1977, 70p.

The DBMS Graphics Package, (with James R. Lee and Elie T.
Nassar), Technical Report CMPS-77-6-6, Computer Science
Department, University of Southwestern Louisiana, Lafayette,
Louisiana, June, 1977, 88p.

"User Interaction Monitoring as a Multi-Level Process," Proc.
ASIS, 1977 Annual Meeting, Vol. 14, 1977, p. 63.

"Information Systems for Minicomputers and Networks: A Course
Proposal for Computer Science Curricula," (with Glenn A.
Shaffer), Proceedings of the Eleventh Hawaii International
Conference on Systems Sciences, Honolulu, Hawaii, January
5-6, 1978, Volume II, pp. 180-208.

Multiple Data Base Support for MADAM: Phase II, (with Glenn A.
Shaffer and George A. Albracht), Technical Report
CMPS-78-6-1, Computer Science Department, University of
Southwestern Louisiana, Lafayette, Louisiana, January, 1978,
69p.

Proposed Research Addressing the Inferential Derivation of
Retrieval Semantics Utilizing a Relational View of a
Meta-Base, (with Thomas R. Cousins), Technical Report
CMPS-78-6-2, Computer Science Department, University of
Southwestern Louisiana, Lafayette, Louisiana, February, 1978,
37p.

"Techniques for Evaluating Computer-Based Systems for Numerical
Data Management," (with Joseph E. Urban), Proceedings of the
Sixth International CODATA Conference, Santa Flavia, Sicily,
May 22-25, 1978, pp. 371-375.

Wayne D. Dominick (Continued)

03/83

Profile Evaluation, Research and Modelling for Science Information Systems: A Report on the Development of a Generalized Evaluation Methodology to Study User Interaction. (with Lorraine Borman), Final Report, NSF Grant No. DSI76-19481, June, 1978, 258p.

Application of a Generalized Evaluation Methodology for Analyzing User Interactions with the MADAM System at the University of Southwestern Louisiana. (with Joseph E. Urban), Technical Report CMPS-78-6-3, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, September, 1978, 347p.

Hierarchical Thesaurus Processing for MADAM. (with Roger L. Patton), Technical Report CMPS-78-6-4, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, September, 1978, 41p.

The USL DBMS Project. Technical Report CMPS-78-6-5, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, September, 1978, 140p.

"The Management of Data Bases of Data Bases," (with Thomas R. Cousins), Proceedings of the 1978 Annual Meeting of the American Society for Information Science, Vol. 15, November 13-17, 1978, pp. 75-78.

"Interaction Monitoring Considerations Within Network-Based Information Systems," (with W. David Penniman), North American Networking Collected Papers, Eighth Mid-Year Meeting of the American Society for Information Science, Banff, Alberta, Canada, May 16-19, 1979, p. F4.

The University of Southwestern Louisiana NSF/RIAS-DBMS Working Paper Series. (Editor and Primary Author), Collection of Reports to the National Science Foundation by the University of Southwestern Louisiana under NSF Grant No. SER77-06835, 1978-1979.

The Design, Monitoring and Performance Evaluation of MADAM (Multics Approach to Data Access and Management). (with Sharad K. Agarwal), Technical Report CMPS-79-6-1, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, August, 1979, 214p.

Wayne D. Dominick (Continued)

03/83

A Proposed Monitoring Facility for the OCLC On-Line System, Research Journal No. 96, Research Department, OCLC, Inc., Columbus, Ohio, August 9, 1979, 98p, (OCLC internal proprietary document).

"Automated Monitoring to Support the Analysis and Evaluation Information Systems," (with W. David Penniman), Proceedings of the Second International Conference on Information Storage and Retrieval, ACM SIGIR FORUM, Vol. XIV, No. 2, September 27-28, 1979, pp. 2-9.

The Design, Implementation, and Usage of BDAP (Bibliographic Data Analysis Package), (with George S. Fissel, Jr. and Christie M. Davis), Technical Report CMPS-79-6-2, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, October, 1979, 206p.

The Design, Implementation, and Usage of an Automatic Data Validation Facility for MADAM Monitor Records, (with Sandeep V. Hemmady and Christie D. Michelsen), Technical Report CMPS-79-6-3, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, November, 1979, 55p.

Proposed Research Addressing the Objective Evaluation of IS&R/DBMS Systems Using Software Engineering Principles, (with Christie D. Michelsen), Technical Report CMPS-79-6-4, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, December, 1979, Revision 1, April, 1980, 77p.

An Overview of a Proposed Monitoring Facility for the Large-Scale, Network-Based OCLC On-Line System, (with W. David Penniman and James E. Rush), Research Report No. OCLC/OPR/RR-80/1, Research Department, Office of Planning and Research, OCLC, Inc., Columbus, Ohio, January 23, 1980, 22p.

"The Application of Software Engineering Principles to Existing Information Storage and Retrieval Systems," (with Christie M. Davis), presented at the 1980 Annual Meeting of the Louisiana Academy of Sciences, Hammond, La., February 8-9, 1980.

Wayne D. Dominick (Continued)

03/83

"An Automated Monitor Data Validation Facility for the MADAM Information Storage and Retrieval System," (with Sandeep V. Hemmady and Christie M. Davis), presented at the 1980 Annual Meeting of the Louisiana Academy of Sciences, Hammond, La., February 8-9, 1980.

"Performance Measurement and Evaluation of the MADAM Information Storage and Retrieval System," (with Peggy A. Nance and Christie M. Davis), presented at the 1980 Annual Meeting of the Louisiana Academy of Sciences, Hammond, La., February 8-9, 1980.

"The Use of Software Engineering Techniques to Support Information System Evaluation," (with Christie M. Davis), Proceedings of the 1980 ACM Computer Science Conference, February 12-14, 1980, p. 43.

"A Methodology for the Objective Evaluation of the User/System Interfaces of the MADAM System Using Software Engineering Principles," (with Christie D. Michelsen and Joseph E. Urban), Proceedings of the 18th Annual Southeastern Regional ACM Conference, Tallahassee, Fl., March 24-26, 1980, pp. 103-109.

"Monitoring and Evaluation of On-Line Information System Usage," (with W. David Penniman), Information Processing and Management, Vol. 16, No. 1, 1980, pp. 17-35.

The DBMS Statistical Analysis Package for MADAM, (with Peggy A. Nance and Christie D. Michelsen), Technical Report CMPS-80-6-2, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, May, 1980, 141p.

The Design and Implementation of the MADAM Data Base Redefinition Subsystem, (with Mohtashim Naveed and Mohammad U. Farooq), Technical Report CMPS-80-6-3, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, May, 1980, 89p.

"The Application of Monitor Data Analysis Techniques to Audit Trail Data From an On-Line System," (with W. David Penniman), Proceedings of the Ninth Mid-Year Meeting of the American Society for Information Science, Pittsburgh, Pa., May 15-17, 1980, (to appear).

Wayne D. Dominick (Continued)
-----03/83

"Applying Available Evaluation Functions to Information Programs and Services - Combining Theoretical and Pragmatic Approaches," (with W. David Penniman), Proceedings of the 43rd Annual Meeting of the American Society for Information Science, Anaheim, Ca., October 5-10, 1980, (to appear).

"Information System Monitoring and Analysis to Support the Evaluation of Computerized Access to On-Line Data Bases: Part I. Monitoring," (with W. David Penniman), presented at the 7th International CODATA Conference, Kyoto, Japan, October 8-11, 1980. Abstract in 7th International CODATA Conference Abstracts, CODATA Bulletin No. 37, July, 1980, p. 45, (full paper to appear).

"Information System Monitoring and Analysis to Support the Evaluation of Computerized Access to On-Line Data Bases: Part II. Analysis," (with W. David Penniman), presented at the 7th International CODATA Conference, Kyoto, Japan, October 8-11, 1980. Abstract in 7th International CODATA Conference Abstracts, CODATA Bulletin No. 37, July, 1980, p. 45, (full paper to appear).

MADAM User's Guide: Volume I = MADAM Users Manual, (with Christie D. Michelsen and Mohammad U. Farooq), Technical Report CMPS-80-8-4, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, December, 1980, Revision 1, January, 1982, 106p.

The Development of Management-Oriented Management Information Systems, (with Yu-Ping Chen), Technical Report CMPS-81-6-1, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, March, 1981, 33p.

The Design and Implementation of Macro Processing for the MADAM System, (with William M. Edwards), Technical Report CMPS-81-6-2, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, November, 1981, 72p.

The MADAM Software Monitor: Monitor Record Structure, (with Mohammad U. Farooq and Christie D. Michelsen), Technical Report CMPS-81-6-4, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, December, 1981, 38p.

Wayne D. Dominick (Continued)

03/83

The Design and Implementation of the MADAM System Administration Subsystem, (with Sandeep V. Hemmady and Mohammad U. Farooq), Technical Report CMPS-81-6-5, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, December, 1981, 55p.

"Generalized Database Management System Support for Numeric Database Environments," (with Peggy G. Weathers), Drexel Library Quarterly Special Issue on Numeric Databases, Vol. 18, Nos. 3 & 4, Summer-Fall, 1982, pp. 177-188.

"The Critical Role of User Education Within the Educational Information Systems Planning Process," (with Peggy G. Weathers), presented at the Twentieth Annual Convention of the Association for Educational Data Systems, Orlando, Florida, May 10-14, 1982, (to appear).

"On Developing Management-Oriented Management Information Systems," (with Yu-Ping Chen), Computer Research Journal - Transactions of TACS (Taiwan Association of Computer Science), Taiwan, Republic of China, Vol. 11, No. 1, January, 1982, pp. 53-74.

Internal Structure of a Computer Aided Oil Refinery Production Scheduling System, (with Yu-Ping Chen), Technical Report CMPS-82-6-2, Computer Science Department, University of Southwestern Louisiana, Lafayette, Louisiana, October, 1982, 75p.

"An Information System Performance Measurement and Evaluation Environment", (with Christie D. Michelsen), accepted for presentation at the 12th Mid-Year Meeting of the American Society for Information Science, to be held in Lexington, Kentucky, May 22-25, 1983, (to appear).

"Controlled Information System Usage Experiments to Support User/System Evaluations", (with Christie D. Michelsen), accepted for presentation at the 12th Mid-Year Meeting of the American Society for Information Science, to be held in Lexington, Kentucky, May 22-25, 1983, (to appear).

Wayne D. Dominick (Continued)
-----03/83
-----Miscellaneous

"DBMS Design Concepts," Keynote Address presented at the ACM Mid-Southeast Chapter Meeting, Chattanooga, Tenn., July 22-23, 1976.

Panelist, "Bibliographic and Numeric Data Bases -- A Comparison of the Online Interfaces," Special Interest Group on User On-Line Interaction and Special Interest Group on Numeric Data Bases, ASIS, 1976 Annual Meeting, San Francisco, Ca., October 5-9, 1976.

Invited Participant, Executive Seminar - Computer Usage in Management, Sperry Univac Corporation, Miami, Fl., October 17-19, 1976.

Session Co-Chairman (with Ronald R. Dueltgen) and Panelist, "Scientific Applications of Numeric Data Bases," Joint Session of the Special Interest Group on Biological and Chemical Information Systems and the Special Interest Group on Numeric Data Bases, Sixth Mid-Year Meeting of the American Society for Information Science, Syracuse, New York, May 19-21, 1977.

Panelist, "Design Considerations for Information Retrieval Systems," Sixth Mid-Year Meeting of the American Society for Information Science, Syracuse, New York, May 19-21, 1977.

Panelist, "Online User Monitoring to Improve User Interaction," Special Interest Group on User On-Line Interaction, 1977 Annual Meeting of the American Society for Information Science, Chicago, Illinois, September 26 - October 1, 1977.

Panelist, "Minicomputer Applications: Where Are We Heading?" Eleventh Hawaii International Conference on Systems Sciences, Honolulu, Hawaii, January 5-6, 1978.

Technical Program Chairman, American Society for Information Science, Special Interest Group on Numeric Data Bases, 1978 ASIS Mid-Year Meeting, May 22-24, 1978, Houston, Texas and 1978 ASIS Annual Meeting, November 13-17, 1978, New York, New York.

Wayne D. Dominick (Continued)
-----03/83

Session Chairman, "Techniques to Support the Management and Evaluation of Numeric Information Systems," Special Interest Group on Numeric Data Bases, Seventh Mid-Year Meeting of the American Society for Information Science, Houston, Texas, May 22-24, 1978.

First Invited Speaker, OCLC Distinguished Seminar Series, Research Department, OCLC, Inc., Columbus, Ohio, June, 1978.

Session Chairman, "Current Applications and Future Trends in Numeric Data Bases and Systems," Special Interest Group on Numeric Data Bases, 1978 Annual Meeting of the American Society for Information Science, New York, New York, November 13-17, 1978.

Keynote Speaker, "Computer Assisted Instruction Workshop," National Science Foundation, Minority Institutions Science Improvement Program, Southern University, Baton Rouge, Louisiana, June 2, 1980.

Keynote Speaker, "Computer Assisted Instruction Workshop," National Science Foundation, Minority Institutions Science Improvement Program, Southern University, Baton Rouge, Louisiana, June 8, 1981.

Keynote Speaker, Southern University Science Research Council Annual Meeting, Southern University, Baton Rouge, Louisiana, April 13, 1983.

Awards and Honors

Recipient, Outstanding Young Men of America Award, 1977.

Listed in Who's Who in the South and Southwest, 1978, 1979, 1980, 1981, 1982.

Listed in Personalities of the South, 1978-79, 1980-81.

Listed in Personalities of America, 1978-79.

Listed in Notable Americans, 1978-79.

Listed in Book of Honor, 1969-79.

Wayne D. Dominick (Continued)

03/83

Listed in American Men and Women of Science, 1979, 1982.

Listed in Men of Achievement, 1979-80.

Listed in the Dictionary of International Biography, 1979-80.

Listed in the American Business Registry, the American Educational Registry, and the American Scientific Registry, 1980.

University-Related Funded Grants/Contracts (Partial List)

"Service to Provide Information Storage and Retrieval for Dissemination of Information on Industrialized Buildings"
 U. S. Army Corps of Engineers
 Construction Engineering Research Laboratory
 Champaign, Illinois
 Contract Number: DACA88-74-C-0058
 Principal Investigator for Northwestern Univ., Evanston, IL.
 Funding: \$15,000.
 Dates: June 26, 1974 - June 25, 1976.

"Interaction with Federal Data Banks"
 Department of Conservation
 Natural Resources & Energy Division
 State of Louisiana
 Baton Rouge, Louisiana
 Energy Management Program #NRE-EM-75-11
 Co-Principal Investigator
 Funding: \$32,709.
 Dates: December 1, 1975 - March 31, 1977.

"Information Storage and Retrieval System Evaluations"
 U. S. Army Corps of Engineers
 USAE Waterways Experiment Station
 Vicksburg, Mississippi
 Contract Number: DACW39-76-M-4232
 Principal Investigator
 Funding: \$3,000.
 Dates: April 1, 1976 - April 30, 1976.

Wayne D. Dominick (Continued)

03/83

"Profile Evaluation, Research and Modeling for Science Information Systems"
 Division of Science Information
 National Science Foundation, Washington, DC.
 Grant Number: DSI76-19481
 Principal Investigator for The University of Southwestern Louisiana under subcontract to Northwestern University
 Funding: Total: \$53,000. USL: \$20,284.
 Dates: September 1, 1976 - June 30, 1978.

"Research Initiation and Support (areas of microcomputer systems, distributed networks and data base management systems)"
 Division of Science Education Resources Improvement
 National Science Foundation, Washington, DC.
 Grant Number: SER77-06835
 Investigator
 Funding: \$178,700.
 Dates: May 1, 1977 - July 31, 1980.

Eighth World Computer Congress - IFIP 80 - Travel Grant
 National Science Foundation, Washington, DC and
 American Federation of Information Processing Societies, Inc.
 Funding: \$1,000.
 Dates: October 6-9, 1980 (Tokyo, Japan).

Consultant on Funded Grants/Contracts (Partial List)

"Advanced Institutional Development Program"
 U. S. Department of Health, Education and Welfare
 Washington, DC.
 Grant Number: G007602486
 Southern University, Baton Rouge, Louisiana
 Funding: \$3,000,000.
 Dates: January 1, 1977 - June 30, 1981.

"Management Information System Consortium"
 Elementary and Secondary Education Act, Title IV, Part C
 Department of Education, State of Louisiana,
 Baton Rouge, Louisiana
 Project Number: 28-791096-0
 Tangipahoa Parish School Board, Amite, Louisiana
 Funding: \$149,200.
 Dates: July 1, 1978 - June 30, 1979.

Wayne D. Dominick (Continued)

03/83

"Minority Institutions Science Improvement Program:
Individualized Institutional Project"
Division of Science Education Resources Improvement
National Science Foundation, Washington, DC.
Grant Number: SER-7907407
College of Sciences, Southern University,
Baton Rouge, Louisiana
Funding: \$265,064.
Dates: August 1, 1979 - July 31, 1982.

Resume

Leroy Roquemore

03/83

Mailing Address

Southern University
Department of Computer Science
P. O. Box 10005
Baton Rouge, LA 70813
(504) 771-2060

Personal Statistics

United States Citizen
Birthdate : 4 April 1935
Birthplace: Columbia, Louisiana

Position

Associate Professor and Chairman, Department of Computer Science, Southern University, Baton Rouge, LA, 1973-present.

Research & Development Interests

Computer-Assisted Instruction
Modelling and Simulation
Software Monitoring and System Performance Evaluation
Data Base Management System Design

Education

B.S., Mathematics, Southern University, 1957.
M.S., Mathematics, Louisiana State University, 1963.
Ph.D., Computer Science, University of Southwestern Louisiana,
(Expected August, 1983).

Other Professional Experience

Co-Principal Investigator, "Minority Institutions Science Improvement Program," National Science Foundation, Grant Number: SER-7907407, College of Sciences, Southern University, Baton Rouge, Louisiana, Funding: \$265,064, August 1, 1979 - July 31, 1983.

Leroy Roquemore (Continued)
-----03/83

Principal Investigator, "Information Systems Technology Study,"
National Aeronautics and Space Administration, Contract No.
NASW-33, 1981-1982.

Review Panelist, The National Educational Computing Conference,
1980-present.

College of Sciences Research Council, Southern University,
1980-present.

Review Panelist, Comprehensive Assistance to Undergraduate
Science Education (CAUSE), National Science Foundation,
1979-present.

Member, Systems Science Graduate Faculty, Louisiana State
University, 1979-present.

National Science Foundation Fellow, Louisiana State University,
1962-1963.

National Science Foundation Fellow, University of Kansas, 1961.

Graduate Assistant, University of Southwestern Louisiana,
1973-1974.

Associate Research Engineer, The Boeing Company, New Orleans,
Louisiana, 1963-1966.

Software Engineer, Western Electric, North Andover,
Massachusetts, 1967.

Project Director, Raytheon Data Systems Programmable Terminal
System 1200 Software Development Project, Southern
University, Baton Rouge, Louisiana, 1978-1981.

Leroy Roquemoire (Continued)
-----03/83
-----Professional Societies

Association for Computing Machinery (ACM)
Special Interest Group on Computer Science Education (SIGCSE)
Special Interest Group on Computer Architecture (SIGARCH)
Special Interest Group on Simulation and Modelling (SIGSIM)
Special Interest Group on Computer Uses in Education (SIGCUE)
Louisiana Academy of Sciences
Data Processing Management Association

Publications

Bradley, H., Roquemoire, L. "Effects of Computer-Assisted Instruction on the Quality of Education in Selected Science Courses," Research Paper, The Louisiana Academy of Sciences, 1983.

Bartley, I., Roquemoire, L. "A Double Distribution Function for a Relational Data Base," Research Paper, The Louisiana Academy of Sciences, 1979.

Roquemoire, L., Williard, M. "Information Systems Technology Study," Final Report, National Aeronautics and Space Administration, Washington, D.C., Contract Number: NASW-33, December, 1982.

Roquemoire, L. "Raytheon Data Systems Programmable Terminal System 1200 Software Development Project," Final Report, Raytheon Data Systems Company, Norwood, Massachusetts, 1981.

Roquemoire, L. "An Invitation to Bid for an Educational Computing System," Southern University, Baton Rouge, Louisiana, 1979.

Morrison, J. W., Prestage, J. J., and Roquemoire, L. Computer Time-Sharing Feasibility Study, Department of H.E.W. (USOE), Washington, D.C., 1971.

"Calculation of a Theoretical Thrust Coefficient," Technical Paper, The Boeing Company, New Orleans, Louisiana, 1963.

"Trajectory Study of Particles from the Exhaust Plume of a Rocket Engine Which Impinge Upon and Cause Heating Problems on a Launch Pad," Technical Paper, The Boeing Company, New Orleans, Louisiana, 1963.

Leroy Roquemore (Continued)
-----03/83

"Problems Caused by Cavitation of a Fluid at the Inlet Ports of Turbo-Pumps," Technical Paper, The Boeing Company, New Orleans, Louisiana, 1963.

"Simulation of Stage Separation and Retro-Rocket Performance on a Space Vehicle," Technical Paper, The Boeing Company, 1963-65.

"Heat Stratification Across the Exhaust Plume from Combustion Chamber of a Rocket Engine During Steady-State Performance," Technical Paper, The Boeing Company, 1963-65.

"Simulation of Ignition, Start, Hold-Down, Lift-off, and Steady-State Performance of a Space Vehicle," Technical Paper, The Boeing Company, 1963-65.

"The Feasibility of Minuteman Rocket Strap-on to Increase Thrust and Specific Impulse for the Saturn Booster," Technical Paper, The Boeing Company, 1963-65.

"A Study of the Characteristics of a Film of Liquid Oxygen Left in a Tank which was Depleted by Turbo-Pumps," Technical Paper, The Boeing Company, 1963-1965.

APPENDIX C

STANDARDIZED COURSE MATERIAL DOCUMENTATION TEMPLATES

STANDARDIZED COURSE SYLLABUS TEMPLATE

- COURSE NAME:** Identification of the name of the course.
- OBJECTIVES:** Specification of the primary objectives of the course in terms of the information and/or experience to be imparted to students of the course.
- PREREQUISITES:** Specification of the basic prerequisites expected of prospective students of the course.
- SCHEDULING:** Specification of the duration of the course in terms of the number and type of instructor/student contact hours and/or laboratory hours.
- COURSE FORMAT:** Specification of the types of instructional formats to be employed in the course.
- REQUIREMENTS:** Specification of the requirements of the students in the course in terms of homework assignments, hands-on RECON usage assignments, examinations, and so on. For graded courses, percentage of final grade associated with each requirement is also specified.
- COURSE OVERVIEW:** Detailed specification of the major topics to be addressed within the course; breakdown of major topical areas into specific component subjects to be addressed; and specification of instructional duration for each major topical area.

REQUIRED READINGS: Specification of alternative required reading material and/or text(s) for the course.

POTENTIALLY REQUIRED READINGS: Specification of the types of reading material that may potentially be required within the course, depending upon instructor prerogative and/or availability of system (RECON) and data base documentation.

REFERENCE BIBLIOGRAPHY: Identification of the reference bibliography provided to support the course.

STANDARDIZED LESSON PLAN TEMPLATE

COURSE NAME: Identification of the name of the course.

LESSON NAME: Identification of the name of the lesson.

LESSON OBJECTIVE: Identification of the primary objectives of the lesson in terms of the information to be presented to the student within this lesson.

MEDIA AND EQUIPMENT: Identification of the presentation media and equipment to be used as part of presenting this lesson.

REFERENCES: Identification of the specific reference material to be employed in the preparation for, and presentation of this lesson.

METHOD OF PRESENTATION: Identification of the specific method(s) of instruction to be employed in the presentation of this lesson.

LENGTH OF LESSON: Identification of the number of instructional hours to be devoted to this lesson.

LEARNING OBJECTIVES: Identification of the specific learning objectives associated with this lesson in terms of the specific capabilities that the student will gain as a result of having taken this lesson.

PLAN FOR CONDUCTING THE LESSON: Identification of the major topical areas to be covered within this lesson; the order of their presentation; and the amount of time to be devoted to each such area.

ASSIGNMENTS: Identification of the specific out-of-class assignments associated with this lesson. Such assignments may include reading assignments, homework assignments, and/or RECON usage assignments, as appropriate.

STANDARDIZED HOMEWORK ASSIGNMENTS TEMPLATE

LEARNING OBJECTIVES: Textual description of the motivation for performing this homework assignment and the learning objectives associated with the assignment.

ASSIGNED TASKS: Identification of the specific tasks to be performed as part of this homework assignment.

STANDARDIZED HOMEWORK ASSIGNMENTS ANSWER KEY
TEMPLATE

ASSIGNED TASKS: Reiteration of the specific tasks to be
performed as part of this homework assignment.

ANSWERS: Statement of correct answers to each assigned
task/question.

STANDARDIZED USAGE ASSIGNMENTS TEMPLATE

LEARNING OBJECTIVES: Textual description of the motivation for
performing this RECON usage assignment and the
learning objectives associated with the
assignment.

ASSIGNED TASKS: Identification of the specific tasks to be
performed using RECON as part of this usage
assignment.

STANDARDIZED USAGE ASSIGNMENTS ANSWER KEY TEMPLATE

ASSIGNED TASKS: Reiteration of the specific tasks to be performed
using RECON as part of this usage assignment.

ANSWERS: For each assigned task, the full text of a series
of user/system RECON interactions which results in
the correct answer(s) to that task.

STANDARDIZED EXAMINATION TEMPLATE

BASIC CONTROL DATA: Identification of basic examination control data, e.g., type of examination (midterm, final, etc.), format of examination (open book, closed book, etc.), duration of examination, etc.

LESSON IDENTIFICATION: Identification of the course lesson(s) relevant to each question on the examination, to ensure coverage of the examination across all lessons comprising the course.

QUESTIONS: Statement of the questions comprising the examination.

STANDARDIZED EXAMINATION ANSWER KEY TEMPLATE

BASIC CONTROL DATA: Identification of basic examination control data (as above).

QUESTIONS: Reiteration of the questions comprising the examination.

ANSWERS: Statement of correct answers to each question.

VISUALS OBJECTIVES --GUIDELINES

- (1) The collection of course visuals will represent a complete and comprehensive presentation of the topical areas defined within the course syllabus.

- (2) The collection of course visuals will provide the framework whereby a qualified instructor can effectively teach the course utilizing the associated course syllabus, lesson plans, etc.
- (3) The collection of course visuals will provide the information necessary to enable a conscientious student to obtain a college-level understanding of the course material and to demonstrate this understanding as evidenced by acceptable performance on the course assignments and examination(s).

ATTACHMENT 4.4

**"TRANSPORTABLE, UNIVERSITY-LEVEL
EDUCATIONAL PROGRAMS IN INTERACTIVE
INFORMATION STORAGE AND RETRIEVAL SYSTEMS,"
WAYNE D. DOMINICK AND LEROY ROQUEMORE,
USL/DBMS NASA/RECON WORKING PAPER SERIES
REPORT NUMBER DBMS.NASA/RECON-3.**

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Report Number

DBMS.NASA/RECON-3

The USL/DBMS NASA/RECON Working Paper Series contains a collection of reports representing results of activities being conducted by the Computer Science Department of the University of Southwestern Louisiana pursuant to the specifications of National Aeronautics and Space Administration Contract Number NASW-3846. The work on this contract is being performed jointly by the University of Southwestern Louisiana and Southern University.

For more information, contact:

Wayne D. Dominick

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 USL/DBMS NASA/RECON Working Paper Series
 Computer Science Department
 University of Southwestern Louisiana
 P. O. Box 44330
 Lafayette, Louisiana 70504
 (318) 231-6308

TRANSPORTABLE, UNIVERSITY-LEVEL EDUCATIONAL PROGRAMS IN
INTERACTIVE INFORMATION STORAGE AND RETRIEVAL SYSTEMS

Wayne D. Dominick

Computer Science Department
University of Southwestern Louisiana
P.O. Box 44330
Lafayette, Louisiana 70504

Leroy Roquemore

Department of Computer Science
Southern University
Southern Branch Post Office
Baton Rouge, Louisiana 70813

11th Annual Conference of the Mid-South Association for
Educational Data Systems, February 22-25, 1984

January 27, 1984

TRANSPORTABLE, UNIVERSITY-LEVEL EDUCATIONAL PROGRAMS IN
INTERACTIVE INFORMATION STORAGE AND RETRIEVAL SYSTEMS

ABSTRACT

Pursuant to the specifications of a research contract entered into in December, 1983 with the National Aeronautics and Space Administration (NASA), the Computer Science Departments of the University of Southwestern Louisiana and Southern University will be working jointly to address a variety of research and educational issues relating to the use, by non-computer professionals, of some of the largest and most sophisticated interactive information storage and retrieval systems currently available at the present time.

Over the projected 6-8 year period of this research contract, it is expected that the following systems will be addressed:

- [1] NASA / RECON
- [2] LOCKHEED DIALOG
- [3] U. S. DEPARTMENT OF ENERGY / RECON
- [4] U. S. DEPARTMENT OF DEFENSE / DEFENSE TECHNICAL
INFORMATION CENTER
- [5] U. S. ENVIRONMENTAL PROTECTION AGENCY / CSIN -
Chemical Substance Information Network
- [6] LAWRENCE LIVERMORE NATIONAL LABORATORY / TIS -
Technology Information System, Intelligent Gateway
System.

This presentation to Mid-South AEDS will overview some of the educational issues to be addressed in the context of developing effective educational programs for training non-computer professionals in the use of very large-scale interactive information systems.

TRANSPORTABLE, UNIVERSITY-LEVEL EDUCATIONAL PROGRAMS IN
INTERACTIVE INFORMATION STORAGE AND RETRIEVAL SYSTEMS

Wayne D. Dominick

Computer Science Department
University of Southwestern Louisiana
P.O. Box 44330
Lafayette, Louisiana 70504

Leroy Roquemore

Department of Computer Science
Southern University
Southern Branch Post Office
Baton Rouge, Louisiana 70813

11th Annual Conference of the Mid-South Association for
Educational Data Systems, February 22-25, 1984

V I S U A L S

OVERVIEW OF THE PRESENTATION

*** EDUCATIONAL OBJECTIVES

*** CONTRACT FUNDING SOURCES

*** CONTRACT TIME FRAMES

*** PARTICIPATING AGENCIES (PROJECTED)

*** OVERVIEW OF COMPUTING ENVIRONMENTS

*** EDUCATIONAL ORIENTED CONTRACT TASKS

*** INFORMATION SYSTEM TOPICS TO BE ADDRESSED

*** FUTURES

EDUCATIONAL OBJECTIVES

*** EDUCATIONAL PROGRAM DEVELOPMENT

- *** Very Large Scale Interactive I S & R Systems
- *** Multiple Systems Orientation
- *** Multiple Data Bases Orientation
- *** University - Level Orientation
- *** Scientific and Engineering Disciplines
- *** Non - Computer Professional Audience
- *** Fully Transportable Course Materials

*** EDUCATIONAL PROGRAM IMPLEMENTATION

- *** Pilot Administration at USL & SU
- *** Pilot Evaluation
- *** "Marketing"
- *** Implantation / Distribution
- *** Continual Enhancement
- *** Periodic Evaluation

*** EDUCATIONAL RESULTS -----> RESEARCH TOPICS

*** RESEARCH RESULTS -----> EDUCATIONAL APPLICATIONS

CONTRACT FUNDING SOURCES

Primary Funding Sources YEARS

*** NATIONAL AERONAUTICS AND SPACE ADMINISTRATION ... 1 - 8
 (N A S A)

*** DEPARTMENT OF DEFENSE 2 - 8
 (D o D)

Other Funding Sources

*** DEPARTMENT OF ENERGY (ENERGY / RECON) 2 - 8
 Oak Ridge National Laboratory

*** LAWRENCE LIVERMORE NATIONAL LABORATORY 2 - 8
 (TIS - Technology Information System /
 Intelligent Gateway System)

*** ENVIRONMENTAL PROTECTION AGENCY 2 - 8
 (CSIN - Chemical Substance Information Network)

*** DEFENSE TECHNICAL INFORMATION CENTER 2 - 8
 (DROLS)

*** LOCKHEED (DIALOG) 2 - 8

*** OTHER AGENCIES WILL ALSO PARTICIPATE

| N A S A |

| 01/27/84 |

CONTRACT TIME FRAMES

	YEARS							
	1	2	3	4	5	6	7	8
NEEDS ANALYSIS	11							
COURSES DEVELOPMENT	1111	2222						
COURSES PILOT ADMINISTRATION				2222	33			
"MARKETING"				2222	3333	4444	5555	6666
							7777	8888
DISTRIBUTION / ADMINISTRATION					3344	4444	5555	6666
							7777	8888
EVALUATION / ENHANCEMENT							5555	6666
							7777	8888

| DBMS.NASA/RECON-3 |

- 8 -

| A E D S |

PARTICIPATING AGENCIES (PROJECTED)
CURRENT NASA / RECON USERS

*** N A S A HEADQUARTERS

*** N A S A SPACE CENTERS / RESEARCH CENTERS

- * Ames Research Center
- * Goddard Space Flight Center
- * Jet Propulsion Laboratory
- * John F. Kennedy Space Center
- * Langley Research Center
- * Lewis Research Center
- * Lyndon B. Johnson Space Flight Center
- * Marshall Space Flight Center
- * . . . Others . . .

*** N A S A USER UNIVERSITIES

- * California Institute of Technology
- * Cornell University
- * Georgia Institute of Technology
- * Johns Hopkins University
- * Massachusetts Institute of Technology
- * Princeton University
- * Purdue University
- * University of California
- * University of Michigan
- * University of Southwestern Louisiana
- * . . . Many Others . . .

*** A FEW OF THE MANY MANY OTHERS

- * Executive Office of the President:
 - * Library
 - * White House Information Center
- * Congress of the United States
- * All Branches of DoD
- * Library of Congress
- * National Bureau of Standards
- * Smithsonian
- * . . . Many Many Others . . .

OVERVIEW OF COMPUTING ENVIRONMENTS

*** NASA / RECON - CENTRAL COMPUTING FACILITY
NASA HQ : WASHINGTON, DC

(Schematic Illustrated on Subsequent Visual)

*** DISTRIBUTED ACCESS WORKSTATIONS / TERMINALS

*** PC - Based Workstations to Provide :

*** Terminal Access to NASA / RECON.

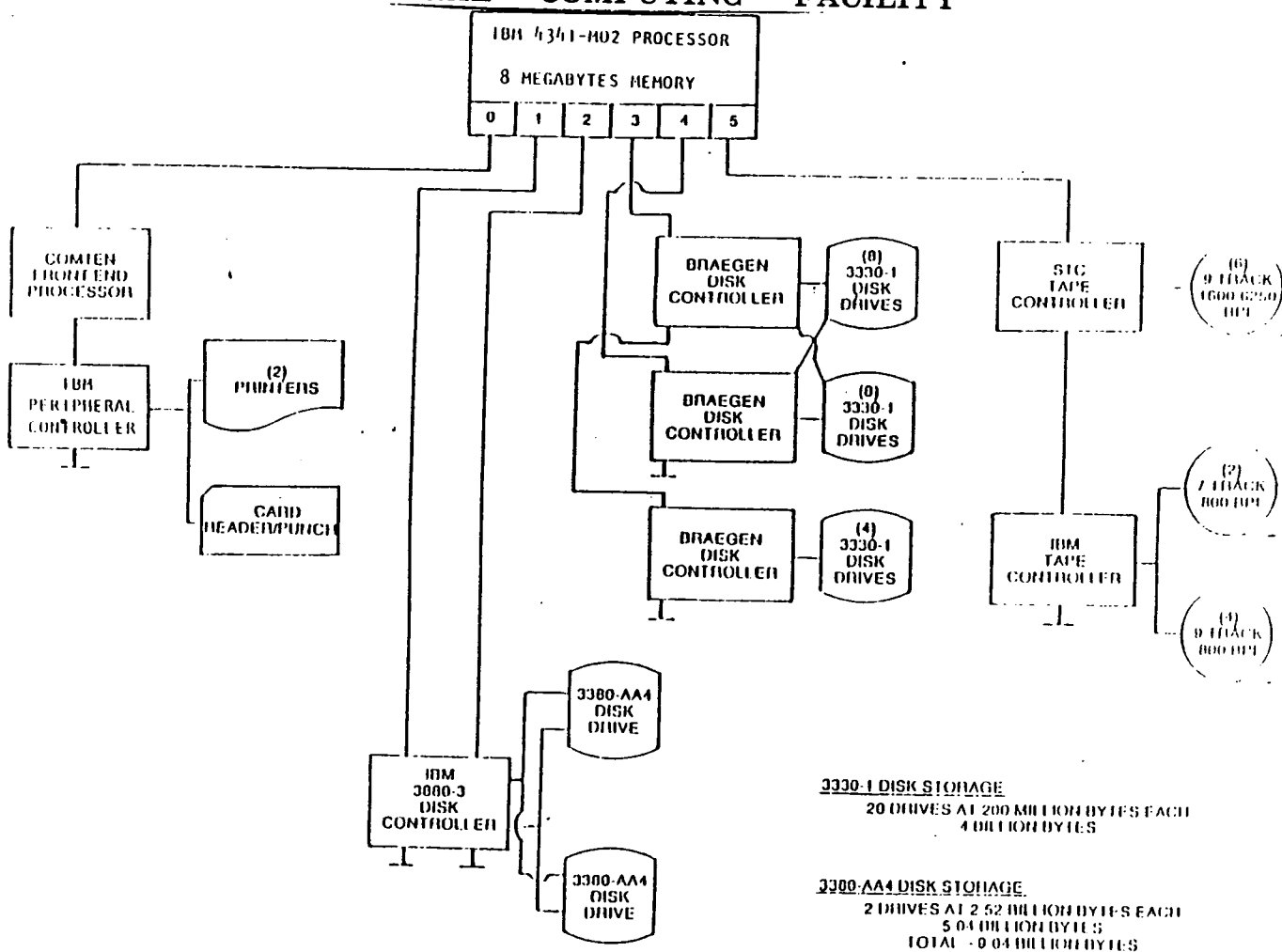
*** Local Standalone Processing.

*** NASA COMPUTER / COMMUNICATIONS NETWORK

(Schematic Illustrated on Subsequent Visual)

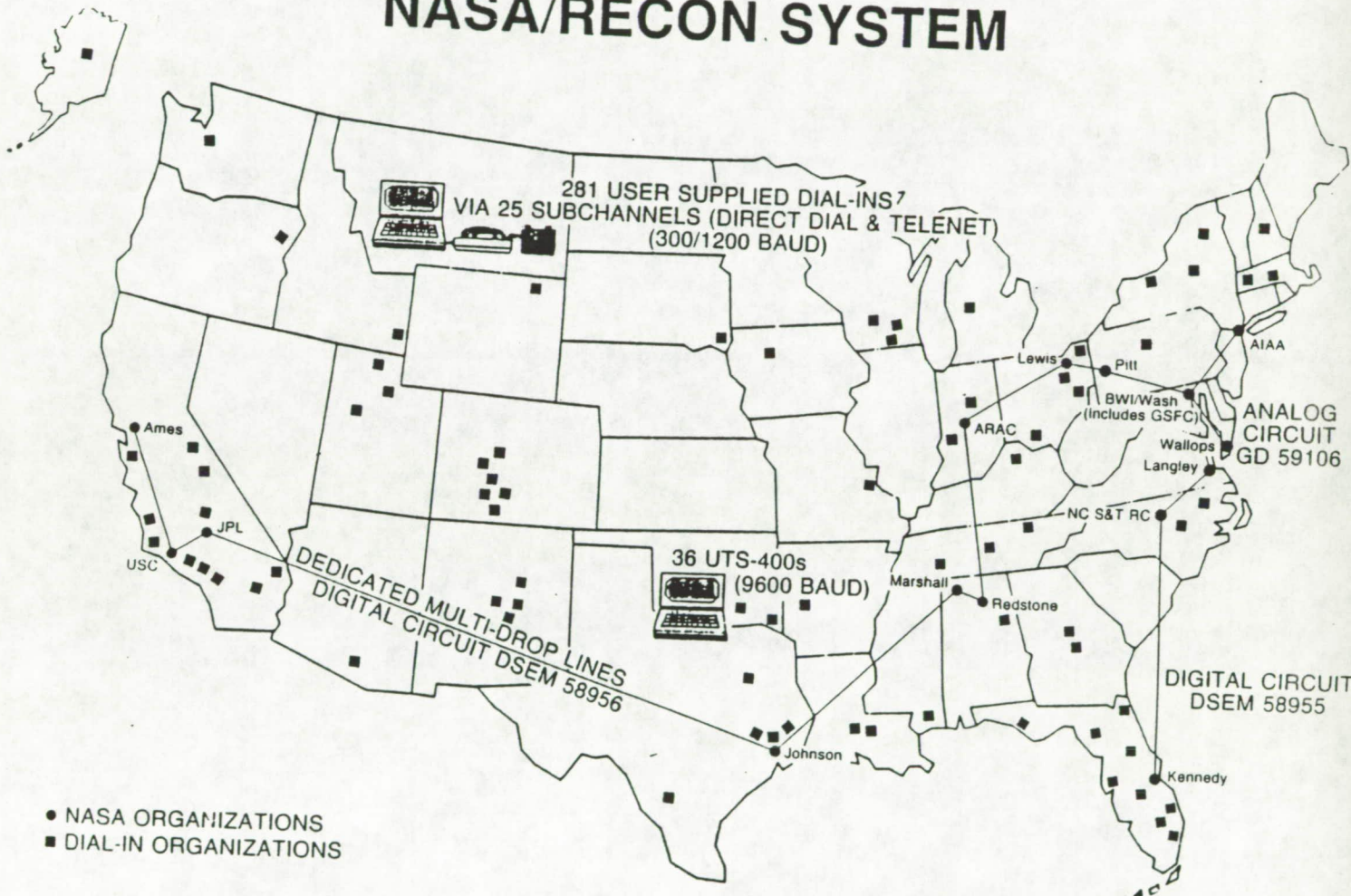
SCHEMATIC OF NASA / RECON CENTRAL COMPUTING FACILITY

SCHEMATIC OF NASA / RECON
CENTRAL COMPUTING FACILITY



SCHEMATIC OF NASA / RECON NETWORK

NASA/RECON SYSTEM



EDUCATIONAL ORIENTED CONTRACT TASKS (Partial List)

*** NEEDS ANALYSIS PHASE

- *** Identify Target Institutions
- *** Develop Needs Analysis Questionnaire
- *** Survey Targeted Institutions
- *** Analyze Questionnaire Results
- *** Phase Evaluation / Interim Report

*** COURSE DEVELOPMENT PHASE

- *** Develop Course Materials :
 - *** Syllabi
 - *** Lesson Plans
 - *** Homework Assignments/Keys
 - *** Usage Assignments/Keys
 - *** Examinations/Keys
 - *** Visuals
- *** Phase Evaluation / Interim Report

*** COURSE ADMINISTRATION PHASE

- *** Implement Courses :
 - *** 1-2 Day Intensive Workshops
 - *** 6 Week Mini-Course
 - *** 18 Week Full Semester Course
- *** Phase Evaluation / Interim Report

INFORMATION SYSTEM TOPICS TO BE ADDRESSED
(Small but Illustrative Subset of Topics)

- *** Feature Analysis of Interactive Information Storage and Retrieval Systems
 - *** User Categorizations
 - *** Data Models
 - *** Logical Data Structures
 - *** Physical Storage Structures
 - *** Data Base Definition
 - *** Data Base Interrogation/Searching
 - *** Data Base Report Generation
 - *** Data Base Update
 - *** Data Base Redefinition
 - *** Data Base Administrative Functions
 - *** Data Base Security Considerations
 - *** Performance Measurement and Evaluation
- *** Bibliographic Data Base Design
- *** Bibliographic File Structures
 - *** Linear File Organizations
 - *** List Structured File Organizations
 - *** Clustered File Organizations
- *** Vocabulary Control
 - *** Controlled Vocabularies
 - *** Free Text Approaches
 - *** Thesaurus Support
- *** Bibliographic Data Base Searching
 - *** Types/Levels of Search Languages
 - *** Search Formulation Features
 - *** Output Generation Features
 - *** Instructional/Diagnostic Features
- *** Additional IS&R Application Areas
- *** IS&R Performance Measurement and Evaluation
 - *** Phases of the PME Life Cycle
 - *** Traditional, Obtrusive User Monitoring
 - *** Advanced, Unobtrusive User Monitoring
- *** Future Information Storage and Retrieval Systems

R & D ORIENTED FUTURES

- *** PC - Based Information System Simulators
&
PC - Based Data Base Simulators
- *** PC - Based C A I Training Mechanisms
- *** Multi - System Common Command Languages
- *** PC - Based Front - End Command Language Translators
- *** Specification / Design / Prototyping of a Robust
PC - Based Scientist's / Engineer's R & D Environment :
 - *** Access to Multiple I S & R Systems
 - *** Access to Multiple D B M S Systems
 - *** Access to R & D Support Tools :
 - *** Statistical Packages
 - *** Graphical Display Packages
 - *** Simulation / Modeling Packages
- *** Specification of Distributed Workstation Functionality
- *** Distributed Workstations / Centralized Mainframes
Intercommunication (Uploading/Downloading) Protocols
- *** Migration of All Contract Deliverables :
University - Level ----> High School - Level

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ATTACHMENT 4.5

"THE MAN/MACHINE INTERFACE IN
INFORMATION RETRIEVAL: PROVIDING
ACCESS TO THE CASUAL USER,"

MARTIN GRANIER,

USL/DBMS NASA/RECON WORKING PAPER SERIES
REPORT NUMBER DBMS.NASA/RECON-4.

N A S A

N A S A

THE MAN/MACHINE INTERFACE
IN
INFORMATION RETRIEVAL:
PROVIDING ACCESS
TO THE
CASUAL USER

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May 16, 1984

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- 1 -

MAN/MACHINE

ABSTRACT

This study is concerned with the difficulties encountered by casual users wishing to use Information Storage and Retrieval Systems. A casual user is defined as a professional who does not have the time nor desire to pursue in depth study of the numerous and varied retrieval systems. His needs for online searching are only occasional, and not limited to a particular system.

The paper takes a close look at the state of the art of research concerned with aiding casual users of Information Storage and Retrieval Systems. Current experiments such as CONIT, IIDA, CITE and CCL are presented and discussed. Comments and proposals are offered, specifically in the areas of training, learning and cost as experienced by the casual user. An extensive bibliography of recent works on the subject follows the text.

KEYWORDS

Man/Machine Interface, Information Storage and Retrieval Systems, Casual User, User/System Interaction, CAI, CAT, Assistance, Help, CCL, CITE, CONIT, IIDA, LEXIS, TRAIN.

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THE MAN/MACHINE INTERFACE

IN

INFORMATION RETRIEVAL:

PROVIDING ACCESS

TO THE

CASUAL USER

1. INTRODUCTION

This age we are living in has been labeled by many as the "Information Age." Since the 1960's, we have seen a tremendous growth in technology, which has made possible the creation of online retrieval systems. It came right on time, because, simultaneously, the quantity of documents and publications available has experienced an expansion never seen before. There would be no way for the old structures - libraries and published indices - to keep up with such a growth, if it were not for the development of technology. However, all is not beautiful for the user: indeed, data is available much faster and more complete, but so far it has been necessary for the user to retrieve information through an intermediary, such as a librarian or an information specialist. This paper will study what are the challenges to the untrained users of online retrieval systems, as well as the options for the future.

2. STATING THE PROBLEM

Online retrieval systems have been very well accepted by the user community, since their early debuts, in the late 60's. The tremendous growth in technology which has happened in the computer field, has been reflected in all areas of data retrieval; research in networking, reliability, memory size and speed, all had important and constructive consequences in the information retrieval area. During the same period the number of databases has multiplied, as well as the number of records in every one of them. By the end of the 1970's, the number of online searches per year, increased from 1 million to 2 million and since then, the growth has kept the same fantastic progression.

With the rapid proliferation of data available on line, and the general acceptance by the general user community of this way of searching, new problems have appeared. One of them is the difficulty for an occasional user to search a database effectively, without human help such as from a professional searcher or a librarian. In order to access commercial systems, the searcher must follow a rigid code: logging in procedures, manipulation language, error messages and help online differ widely from one system to another. All claim, to a certain extent, to be "user friendly", (or even better "ergonomic!"), but

that is seldom the opinion of the end-user!

2.1 The Intermediary

To remedy these difficulties, a quite general approach in business and university environments is for the person in need of information to go to a professional searcher, well trained for online searching, and to use him as an "interface"! Generally, it is thought that only between 10% and 15% of the searches being performed are performed by the end-users themselves [Wanger, 79].

However, for reasons which are explained in this report, it can be interesting for users to perform the searches by themselves, instead of through an intermediary, as the case normally is. The advantages of having a professional searcher working online are tremendous, there are no doubts about that; but some difficulties exist, such as communication between user and searcher, time frame, availability of each party, and other incompatibilities. Furthermore, the user could very well benefit from hand-on experience, and even retrieve information "accidentally", perhaps by discovering new keywords while online or modifying search strategies while online.

2.2 Problems and Challenges

It is also important for the reader to realize that the success and the growth of interactive bibliographic retrieval systems have been such that users, in recent years, have found themselves facing huge challenges. The difference between the systems available, their organizations, indices, thesauri, retrieval languages and procedures make occasional searching quite an enterprise. Some kind of standardization is clearly overdue, but, in the meantime, what should be done?

Recently, many efforts have been made to make online bibliographic retrieval systems easier to use by the end user. In fact, since the early days of computers, designers have attempted to befriend the users: from user training and online help, to the use of a "mouse," the promises are many. However, problems remain, and we will examine the ones users of online retrieval systems encounter.

In the retrieval systems, the problem is twofold:

- (1) On one hand, it is extremely difficult, if at all possible, for the end user, to perform searches well and efficiently, if he has not acquired some kind of practice, and even expertise in the system he wishes

to use.

- (2) On the other hand, how is he to acquire this experience if his searching needs are not only occasional, but also require the use of various systems?

Here is a perfect "Catch 22", which many have tried to circumvent. This paper will study the different approaches possible, in order to resolve the problems facing a casual user desiring to search information online by himself.

2.3 The Casual User

A user, let's say a scientist, whose searching needs are only occasional does not wish to spend long and repetitive sessions learning how to use a specific system. He could very well do it, as his intellectual faculties are not in question, but he does not have the time - nor the desire - to study query languages he will use only one or two times a year.

For the purpose of this paper, a person whose knowledge in online retrieval is limited, and whose extent of experience in this form of search is only minimal and occasional, will be defined as a "casual user". The casual user's understanding of

the system is limited to the generalized concepts of records, indexes or keywords. Throughout this paper, and unless specified otherwise, a "user" will mean a "casual user" as defined above.

Let's observe a casual user wishing to have access to a retrieval system. He is unfamiliar with the search procedures, the command language, the database. Even more, he could be a novice in the use of a terminal or logging in procedures. He needs help! The most likely option for him, at this point, is to go to a professional "searcher" (1) and formulate his wishes. However, a problem of communication will rapidly take place if the professional searcher does not have some knowledge in the scientist's field. The best solution, in order to remedy this specific difficulty, is for the two of them to work and search together. Of course, the solution is far from ideal (2) : a gap still exists between the two, and frustration is quite likely if errors or delays result. What is more, the user always needs his information "immediately", when the professional has some "other urgent matters to attend to, before proceeding with this request..."

(1) In a university environment, a librarian would have the appropriate training.

(2) Even if it is the most recommended approach.

2.4 "Leave the Casual User Alone!"

Thus, there exist many cases when the user, the "scientist" from above, would like to perform his searches by himself. By doing so, he will have more freedom and he will get the feeling of moving in "terra cognita": after all, those formulas, those scientific names, if they have no meanings to the librarians, they should have some for him... Above all, performing his own search, the user has the opportunity to "browse" through the records, like he would do about library shelves. It is because of all these points, that it has become interesting to investigate the feasibility of systems which would allow casual users to search the databases without external help.

However, as we will see, the options and the problems are numerous. The options are, for example, to train the occasional user in a quick and easy way, but the problems there are too clear: which shortcuts are acceptable? Others options are to simplify the language(s) needed to access a system. As long as some "standard languages" do not exist, would it not be good to have a language allowing access to different systems? It would also be valuable to have interfaces "counseling" the users, before sending the queries to the commercial system: users would save time, money and much irritation. Those solutions have been investigated already, and this paper will detail them to the

reader, with their good and their bad points. Other ways are open, as will also be shown.

2.5 Goal of the Paper

The author of this paper firmly believes that online system searches benefit from user involvement. Thus this paper is going to study ways to guide an inexperienced user through the maze of the searching world. It is first going to study the question of training the users, and then different systems which have been realized during the past few years, all in the hope of curing the unfriendliness of retrieval systems toward inexperienced users. Finally, the author will offer some personal remarks, comments, predictions for the near future, as well as some guidelines for user-friendly systems.

3. EDUCATION

The easiest way to have users able to fully use a system, is to give them some kind of formal training. Most commercial system's vendors will be pleased to send representatives of their organizations, in order to train the future users. For several days, within a classroom or online using some "canned example," the naive users will slowly lose their innocence!

Manuals are also of great value, of course, and should always be available. They describe, hopefully in laymen's terms the how - and sometimes the why - of each command. If the instruction manuals are considered insufficient or, more often, too complex for beginners, simpler guides are available, explaining commands step by step. (1)

This paper stated earlier, however, that a casual user does not have the time nor the desire to sit in a formal classroom in order to be taught all the tricks and short cuts of a system he will use only once or twice a year. In this section, the reader will find only a quick overview of some of the most original approaches.

3.1 CAI/CAL or Computer Assisted Instruction/Computer Aided Learning

In this section, the reader is invited to consider that some form of training seems indispensable for any user: the question is how little is enough, and how in depth can it be without bothering the casual user. For these reasons, the formal type of training is not analyzed in this study. The literature on the

(1) For example, Robert Laurence wrote a "Self Teaching Exercise" for LEXIS, which is a textbook at the University of Illinois Law School [Laurence, 78].

subject refers to Computer Assisted Instruction (CAI), to describe training offered online. There are two types of instruction which can be differentiated:

- (1) The first type is the instruction as offered by an online system. TRAIN, for example, is offered online by DIALOG. This category has not been specifically designed for casual users, and it is often time consuming and expensive. Thus it will only be mentioned here.
- (2) The second type is CAI as a "canned exercise". In this case, the student is instructed offline, by examples and exercises, using simulation, emulation of a system, or a subset of a system's databases. This solution has the double advantage of being cheaper and, potentially, more individualized (ie: designed for a specific class of users). In this class, one of the most interesting and most successful cases is the TRAINER, described below.

3.2 TRAINER

The University of Pittsburgh has a CAI system, called the TRAINER system, which has been in operation since 1978 [Caruso,

78]. It provides both instruction and training for online searching, and teaches users, by emulation, how to use a retrieval system. That is, it simulates the functions of retrieval systems, and allows users to obtain training, without using expensive commercial service connect time and telephone connections.

TRAINER was developed by Elaine Caruso, under an NSF Grant [Caruso, 77]. It helps users to learn how to access a system and operate searches in an economical way, with feedback, and no time pressure, because the trainee is not connected to commercial systems while experimenting. The TRIANER system teaches users to operate retrieval systems by emulating them on a stand alone computer.

The user can use DIALOG-like commands, or ORBIT-like commands in order to emulate actual searches. The searches are performed on a subset of Lockheed (for DIALOG) and SDC (for ORBIT), accessing 3 data files, and the entire session looks like real DIALOG and/or ORBIT.

A user who does not wish to, or can not spend time in a classroom, but would benefit from a session of training, would be a good candidate for TRAINER. At his own pace, he could choose any of the seven instruction modules available, or directly go to

the emulation modules, and start familiarizing himself with them.

The advantages are reduced cost, because no online connections with the commercial systems are required (1) and convenience, as the user gets trained on two widely used systems, at his own speed and when he wishes. What is more, a casual user can easily select the TRAINER's exercises he needs, and get information and training on, and only on, a particular subset. The capabilities offered by individualized training are one of the requirements needed in order to please a casual user.

However, there exists some important limitations, the major one being that the training is done on a very restrictive subset of the databases. Also, the code is written in ANSI FORTRAN, certainly not the best choice for data and string processing. Also, the portability of the system is far from being adequate: the TRAINER runs at University of Pittsburgh, on a PDP 11/40 and many attempts to export the system have only shown that TRAINER likes DEC best [Caruso, 81]!

After this very rapid overview of what kind of training is available online to the casual user, the next chapter of this paper is going to take a close look at the way some systems have

(1) TRAINER is available for dial-up access through the educational network EDUNET/TELENET.

approached the problem of casual users desiring hands-on experience.

4. STATE OF THE ART

In the next few sections, some systems, research and experiments will be presented. Each one of them has been selected because its particular approach in handling casual users is original and of importance. The selection was also based upon the availability of literature and published material. (1)

First, LEXIS will be presented as a commercial system intended for a casual user community. Then CONIT, a research project at MIT, will be explained and will show how it is possible for a user to access many retrieval systems using a single language and a set of procedures. IIDA, from Drexel University will give the example of a system helping the searcher to search "well". Finally CITE will give an example of a natural language approach.

(1) Which explain the number of NSF grants studied in this report

4.1 LEXIS

4.1.1 Presentation

The first system this paper has chosen to study is LEXIS. There are many reasons for this choice, the most important one is the fact that LEXIS has, indeed, been created for a "casual user" community, as defined earlier. Another reason is the wide acceptance of this system in this country and overseas. Finally the ease of use, and the little training required makes the experience worth being studied.

One of the most successful examples of online retrieval system for casual users is given by Mead Data Central's LEXIS, and the newer NEXIS and LEXPAT, (however, for the present study, only LEXIS will be discussed, as the 3 systems are quite similar, and LEXIS is by far both better known, and more heavily used).

LEXIS was created in 1967 (1) and started its nationwide expansion in 1973. It was designed to be an interactive time-sharing system, specially molded for lawyers' use. Its databases contain full text of all federal cases, as well as state cases in dozen of states, and other specialized libraries.

(1) Back then, LEXIS was known as OBAR ("Ohio Bar Automated Research").

The user has also access, with special billing, to DIALOG, New York Times Information Bank, Encyclopaedia Britannica and NEXIS. The hardware and retrieval procedures have been designed with the legal community in mind, and the legal community is a perfect example of a community of "casual users" as described above. Lawyers are professionals, who certainly feel that their time is valuable -at least, it is expensive!-. They do know how to search, as they are familiar with the concepts of keywords, indices and abstracts which they use in their libraries, but most of them are computer-illiterates. LEXIS answers most of the legal community's needs.

By the end of 1983, LEXIS functioned on two Amdahl 5860 mainframes, located in the Mead Center, in Dayton, Ohio. The network is the Med-Net Network and the terminals needed by the users are owned by LEXIS (however, because competition is now shaking the market (1), LEXIS is now also available to the owners of IBM PCs, IBM 3101, IBM Display-Writer and Televideo 950 terminals).

4.1.2 Searching LEXIS

(1) Note: In the US, competition to LEXIS is composed mainly of WESTLAW, JURIS (Justice Retrieval and Inquiry Systems), AUTO-CITE (Automated Citation Testing Service) and FLITE (Federal Legal Information Through Electronics).

A LEXIS user will typically search words or sentences within a text; Boolean logic is used, and a few common words are eliminated. It is a full-text system, with no pre-indexing, and therefore the user can search the entire text for a word or a sentence. But what makes LEXIS especially interesting, and that is why it is discussed in this paper, is its ability to communicate in plain English. The function keys are numerous and clearly marked. For example, some are labelled: NEXT PAGE, NEXT CASE, HELP, CHANGE FILE, CHANGE LIBRARY ...

The following function keys are worth being mentioned:

- (1) FULL displays the full text.
- (2) CITE gives title, date and formal citation
- (3) KWIC shows searchword in context (25 words)
- (4) THESAURUS will suggest synonymous, related terms.
- (5) CLIENT will help billing client to relevant searches.

LEXIS allows features which are quite interesting, all very easy to use, such as a search in a range, where the user can find a keyword within "n" words of another keyword.

For example: 'louisiana w/5 university' will retrieve all occurrences of the citations mentioning both words within 5 words of each other, with the searchwords highlighted. (1)

According to MEAD's recent publicity, the average session online lasts 15 minutes, and the average time for retrieval is typically 15 seconds.

4.1.3 LEXIS Conclusion

In its limited area, legal searches, LEXIS has triumphantly resolved the problem of a casual user accessing an online system without external help. It is possible for a user to sit at a terminal, without prior experience, and to retrieve meaningful, and complete information in a reasonable amount of time. Thus, LEXIS has seen, since 1975, the creation of many associations of users, in local law libraries and bar association. In those environments, users are clearly occasional searchers: it is because of their rare need for online retrieval, that those lawyers could not justify a personal subscription to the MEAD's system. LEXIS does seem to satisfy the casual users in the legal world [Larson, 80].

(1) In "LEXIS Legal Research", published and distributed by Mead Data Central to prospective clients. Copyright 1982 MDC (pp. 11).

LEXIS has also resolved the problems inherent to the most traditional type of searching such as the time lag before hard copy is available and the subjectivity brought by indexing: the time lag is negligible (1) , and the subjectivity is absent, as indexing has disappeared. And since indexing has disappeared, all data is searchable.

But, non-indexing has also its drawbacks. The main argument against it is, of course, the fact that many irrelevant documents are retrieved. It is also frequent, for somebody not familiar with the laws and the legal vocabulary, to miss some cases, maybe some important ones. In other words, it can be said that the role of the indexer has always to be assumed by somebody. In full-text, the searcher himself has to play the role of the indexer.

Because of those points, the use of LEXIS is incompatible with users who do not know well the world, and the vocabulary of the legal environment. It is also impossible for a searcher to perform well as long as he has not identified relevant terms and searchwords. Thus, LEXIS has gone a long way from more traditional retrieval systems: a LEXIS' searcher will perform

(1) The time lag could eventually completely disappear, if and when the court reports and laws are entered directly in the databases, a possibility not completely utopian.

well as long as he knows his domain. His expertise in law is primordial, and knowledge in other conventional systems would not help him very much.

The domain of legal research will change quickly in the mid 80's. The concept of full-text retrieval is clearly favored among lawyers, but, as the size and number of files increase, it is clear that more research is needed in order to keep retrieval speed and efficiency at the high standards which are known today. (1) As Users become more numerous, and require more searches, they are likely to ask more from these systems which have performed so well in the past.

There is also considerable competition on the legal market. Westlaw, LEXIS' major competitor has made great progress in the past five years. It has added full text search capability, once unique to LEXIS, while keeping its "key-number" system, so familiar to lawyers. (2) Also, Westlaw is compatible with almost any hardware on the market, an issue of interest to small firms, and which LEXIS will have to accept.

(1) Many authors argue that the growth has attained some maximum, and that increases are likely to slow down. However, as more and more cases are being argued, and retrospective material is being added, the size of legal databases will continue to grow for the next few years.

(2) West Publication is the major legal publisher in the U.S.

Thus, the casual user seems to be the winner in the legal profession: the quality of past service and the new competition have forced LEXIS to improve, and users can expect extended services in the years to come. Finally, it should be noted that LEXIS is also remarkable by the fact that even if it allows easy use for the infrequent user, it does so without inhibiting the experienced searchers: very "fancy" searches are possible on the system. Thus, the two class of users - casual and experienced - are united under the same interface, which is a rare achievement.

4.2 CONIT

CONIT, for "CONnector for Networked Information Transfer," is one of the best examples of an attempt to help the casual user of information retrieval. It is an experimental computer interface which was developed at MIT, by the Electronic Systems Laboratory, under Richard S. Marcus. The system was designed to provide a translating tool between the users and various retrieval systems. CONIT's success has been demonstrated experimentally, and it has been used as a basis for other projects. (1)

(1) For example, see IIDA, further in this paper.

4.2.1 Presentation

CONIT allows the user to access many different retrieval systems, using a common language, during a continuous session. Usually, the heterogeneity offered by a group of systems creates obstacles at different levels: the user must know different access procedures, in order to log-in and to exit the system. He must also know different languages in order to perform searches and request outputs. Finally, he must be aware, even if only slightly, of the indexing vocabularies and the retrieval capacities of the system. As a matter of fact, even within a given system, it is possible to find differences in indexing methods and other inconsistencies, like difference in catalog record fields.

The approach used by CONIT is quite original: it can be described as an attempt to present to the user a single "virtual system," with a single manipulation language. The virtual system consists of many commercial retrieval systems, with all their complexity and originality preserved. However, to the user, all those system "look like" a unique and homogeneous system.

CONIT works on the MIT's MULTICS system. Currently it can access four commercial retrieval systems: Lockheed DIALOG, SDC ORBIT, NLM and SUNY Medline, as well as MIT's own "INTREX."

MULTICS¹ accesses those systems through a device called the "autocall." Autocall takes care of dialing the system's number, and informing the user of the reasons for delay, if they occur.

The CONIT interface provides a common access to a network of different online bibliographic retrieval systems. The user views a global or virtual system, which he accesses through a common language. That offers a flexible and dynamic means for handling the interconnection between the searcher and the database.

4.2.2 Study of CONIT

The language used by CONIT was designed in such a way that all of the functions needed for information retrieval operations can be expressed. Thus, each language $L(i)$ from the original systems, has been broken down to its most elementary pieces: each one of the elementary pieces is unique, that is, two different languages will not have two similar elementary pieces, unless their meaning is equivalent to each other. From those unique parts, a common language function is built as a MACRO of the common language.

The structure of the language is always:

- (1) VERB (which is a Command).
- (2) A space.
- (3) An argument (where an argument can be a list of arguments).

The verbs can be abbreviated, and space and arguments are not always required.

4.2.3 Searching with CONIT

The stream of input coming from a user, or from a system in response to a user's request, is matched against a set of rules. The advantage of matching strings against a table is that the number of rules can be varied over time, and the rules modified if necessary. Also, the rules are organized in such a way that longest matches occur first: thus, a rule NNNN will match first an incoming string NNNN. But, if a match does not happen, a rule NNNX would be checked for matching, and the process repeated until the end of the table is reached. This smart approach has helped keep the number of rules to a very small number. (1)

An example of a rule can be given by:

(1) In CONIT 3, less than 80 (basic) rules were necessary

--> RLE--3/TELENET//Telenet Responding/RLE::4/Send

1 / 2 // 4 / 5 / 6

where:

1 is the Context String (the State at Start).

2 is the Match String (the Incoming String to be Matched).

3 is the Host Message (the Message for the System, if any).

4 is the User Message (the Message for the User, if any).

5 is the Next String (the Next State).

6 is the Special Action (if Action is Required).

The meaning of the rule in this case, would be:

1

R for Retrieval System : the message comes from system.

L for Logging Procedure : we are in the Logging stage.

E for Telenet : the network is Telenet.

- for "do not care" : any character would match.

3 for step 3 of Logging.

2 TELENET is the string to match.

3 no message for the host, since host is the sender.

4 "Telenet Responding" message is sent to user.

5 Next Context is R, L, E, : (do not care) and step 4.

6 If match occurs ==> action.

As a further example of commands, and capabilities of the system, the reader is invited to consider the following examples.

A user entering the command:

--> PICK SYSTEM-NAME

would initiate the following procedures, which will occur without any further commands from the user's part:

(1) Send message(s) informing user of "what's going on."

(2) Dial the correct number of the network (Tymnet/Telenet), via the autocal.

(3) Inform the user of how to leave the system (disconnect).

(4) And send the following messages, as soon as appropriated:

- (a) Phone connection made with [Tymnet/Telenet].
- (b) [Tymnet/Telenet] responding.
- (c) Logging into [System-Name].
- (d) You are now connected to the [System-Name] retrieval system.

>>>> At this point, the user will choose a particular database: (i.e.: "SOCIAL SCIENCE (No 51)")

- (e) You are now connected to the [SOCSCI (NUMBER 51)] database.

- (f) For explanation of how to find a document, type: 'e find'.

and finally, the user is logged in. In the previous example, the user would be logged in, ready to use the database of his choice.

In most of the cases, however, the casual user will not have to bother about selecting a specific system. After a:

---> SHOW DATA

command, CONIT will indicate a set of available "areas of interest". From this set, the user will select one group. Let's

assume for the sake of example, that the user wants to investigate the area of Social Sciences (No 51). He will type:

---> PICK 51

Note, that all he had to do, was to select an area of interest: very often the casual user is not interested in knowing which system brings him the information. CONIT will select a system according to system selection rules, which can be overridden by the user at his choice. Two of the most important rules are:

- (1) If a system is already online, use that system.
- (2) If MEDLINE is desired, use SUNY, instead of NLM, since SUNY is cheaper and often less busy.

Note also, that in order to switch from SYSTEM-NAME to SYSTEM-2, the user will only need to type:

--> PICK SYSTEM-2

and all of the necessary logging out from SYSTEM-NAME, dialing and logging in to SYSTEM-2 will be taken care of by CONIT.

It is now possible to search, change database, consult the index, request outputs and keep the results of searches in an

out-file for later consultation.

4.2.4 Comparing the Languages

On page 34, the reader will find some examples of the CONIT requests. They have been compared to the DIALOG and ORBIT requests they simulate. A column of MADAM equivalent commands has been added for references (MADAM is a retrieval system which has been developed at USL, Lafayette, LA, where this paper was also written). SUNY and NLM Medline examples have not been given, because their syntax is very similar to the language used by ORBIT.

Note that translations are necessarily approximate, since exact translations are impossible, as will be shown later in this paper.

CONIT	DIALOG	ORBIT	MADAM
PICK system	[logout/login]	[logout/login]	MADAM / QUIT
PICK DATA file	* FILE file no.	FILE file name	change db
SHOW INDEX term	EXPAND term	NEIGHBOR term	(see footnote)
FIND topic	SELECT topic	FIND topic	topic
FIND AUTHOR name	SELECT AU = name	FIND name (AU)	SE AU = name
FIND a AND b	SELECT a (C) b	FIND a AND b	SELECT a AND b
COMBINE SET m AND SET n	COMBINE m * n	m AND n	SE SET m AND SET n
COMBINE SET m OR SET n	COMBINE m + n	m OR n	SE SET m OR SET n
SHOW	TYPE x/2	PRINT	DISPLAY
SHOW TITLE	TYPE x/6	PRINT TI	DISPLAY [ti]
SHOW OFFLINE	PRINT x/2	OUTPUT OFFLINE	PRINT
SHOW SET n	TYPE n/2	Sn/OUTPUT	[on] DIS. [n]
SHOW NEWS	?NEWS	NEWS	* db [or] sb
EXIT	LOGOFF	* STOP	QUIT

Note: Index Browsing exists in MADAM as Interface, not yet fully implemented.

TABLE 1 Comparison Between CONIT and Three Other Systems

4.2.5 The Problems

CONIT has demonstrated, after 7 years of research and use, that it was indeed a successful tool in helping casual users retrieve relevant information from different databases, and CONIT did so without causing too great an increase of time online. However, the system has also shown some difficulties inherent to such an approach: some are clearly due to the implementors' choices, while others are somewhat accidental; these points will be presented and analyzed here.

The problems with CONIT, at least CONIT such as described by the literature available to the author of this review, come mainly from the imperfection of the translation. The question of "how exact must a translation be?" is one which can be argued for quite a long time, because, just like for human languages, a perfect translation is probably impossible to obtain. So, "how good is good enough?" is up to the designers to decide. But the following points are worth noting:

- (1) By simplifying the language, many valuable options have been lost from the original, - even if those options were available in ALL of the original systems. For example, the systems retained by CONIT all have the capacities of "Search History", and to repeat on

equivalent search on different databases, but CONIT does not allow those facilities.

- (2) Some particularities of systems have been preserved, which is clearly a choice of the designers. But the global view of the virtual system suffers from such exceptions.

--> PICK DATA FILE

is a number in DIALOG (for .FILE FILE no), but a name for ORBIT (for FILE FILE NAME).

An other example is the

--> SHOWING NEWS

which is not sufficient for all systems. Thus, for the MEDLINE news, the following is needed:

--> PICK NLM NEWS

Of course, there are many difficulties in constructing a consistent translation, and this paper points only to those weaknesses, even if reasons are recognized.

4.2.6 CONIT Conclusion

In conclusion, CONIT has clearly shown that it was possible for a computer intermediary system, to assist users with no previous experience, in retrieving information from dozens of heterogeneous databases, coming from 4 different systems. It has also proved to be a useful tool, and a valuable help to casual users; however, its efficiency and performance are clearly inferior to "the retrieval effectiveness achievable by expert human intermediaries working in conjunction with the end user", as Marcus himself puts it [Marcus, 81]. The question of "how exact a translation should be" remains, and it is one which become more important all the time, with natural languages being studied more intensely.

4.3 IIDA

An example of a computer system serving as intermediary between a user of online bibliographic systems and the system itself, is the IIDA (Individualized Instruction for Data Access).

4.3.1 Presentation

IIDA has been developed at Drexel University, with the financial help of the National Science Foundation. Professor

Charles T. Meadow started the project in 1976. The Software used in IIDA, is a direct descendant of MIT's CONIT and Caruso's TRAINER, both already described. The MULTICS system is the computing environment used for the project, and the Data Base Search System is Lockheed DIALOG System.

4.3.2 Study of IIDA

The IIDA was designed to offer online instruction and assistance to casual users of bibliographic database systems. This extensive help is available to the relatively inexperienced searcher without human intervention. IIDA offers the example of a system where major procedural errors are detected by the computer, and where inexperienced searchers are offered assistance in order to complete their searches. This kind of intermediary facility is known as an "expert system."

4.3.3 Two Modes Available

IIDA is an interface lying between the terminal of the searcher and the retrieval system of the search service. (1) IIDA acts as a "screen," and provides instructions and diagnostic capabilities. That is, it will monitor the user-system exchange,

(1) At this time, Lockheed's DIALOG is the retrieval system used by IIDA.

it will keep track of all data transfers, record history and perform analysis of each and every search. It will also give all this information to the user, if requested to do so. In some cases, IIDA will even take the lead, and signal to the user some errors, inconsistency or messages related to the state of the system (errors, disconnection, line over-use, shut down ...)

IIDA works in two distinct modes, which the user will select himself: the "exercise mode" and the "assistance mode", which are explained below.

Exercise mode. A first time user, or a user who has not searched for quite a long time, will probably favor this type of monitoring; here, IIDA exercises extensive monitoring, and the user is closely "watched" by the system. This mode is to be used mainly for training, and for improving search skills. It can be described as an introduction to the commands and to the development of search strategies.

Three different types of exercises compose the exercise mode. The user has the choice of which exercise to go through. The order represents an order of increasing difficulty. During each of the sections, the user has access to the "help" library.

- (1) Exercise 1 is a "canned exercise". The user answers IIDA suggestions (menu driven or prompting). This

way, the user learn the "basics" and the syntax of the language. Each presentation of a concept is followed by examples that the user completes. The system does not intervene if the answer is not correct: it is a very basic introduction to the system, but enough to get started.

- (2) Exercise 2, which uses only a subset of the language, allows limited search with only: BEGIN, EXPAND, SELECT, COMBINE, PAGE and TYPE which were introduced in exercise 1. The search is also restricted in its sequencing (i.e.: a combination is necessary before any output can take place).
- (3) Exercise 3 utilizes the full language, but there is still a restriction in the logical sequencing of the instructions.

Assistance mode. The assistance mode is the normal mode to be used when performing searches. The IIDA monitoring is very discrete, intervening only when difficulties appear, or when specifically requested by the user. In order for IIDA to perform its counseling role, it must gather enough information from the search, as the reader will see below.

4.3.2 Information Gathered

During the exchange between the user and the system, IIDA gathers the history of the following data:

- (1) Command: The text of each command is stored as entered, and then parsed, in order to have each element of the command stored as independently addressable data.
- (2) Set: All sets created are stored (just as the DIALOG "ds (display set)"), with additional pointers and descriptors which allow further comparisons. Also, those sets are clustered according to similarity of defining terms.
- (3) Descriptor: All the descriptors used in search commands are present in a descriptor table. The descriptors which have been already viewed by the users are specially marked.
- (4) Sets retrieved: A table of all sets viewed is also formed. This table indicates for each record retrieved, its relevance and its ties with a set.
- (5) Error: Each "ERROR" is noted in its context, and thus

available for further analysis.

All this data is gathered for further analysis of the user-behavior. For the sake of keeping statistics and general system evaluation, IIDA keeps also track of all the features searchers use on the system. Mainly, the HELP session are kept in a separate table.

4.3.5 Monitoring User's Activity

As was said earlier, the main purpose of an expert system is to help the user in his necessary exchange with the computer. Thus, IIDA will monitor this conversation, and pick up some (if not all) problems. A list of most of the categories of problems identified by IIDA follows: it is not exhaustive, but represents the framework behind such a system.

(1) ERRORS:

Syntactic Errors: such as invalid commands or abbreviations, invalid characters, bad format in command, invalid operators, parenthesis missing ...

(2) POOR USAGE:

(a) Under use of facilities:

- Failure to EXPAND, especially after creating

several null sets.

- Failure to TYPE or DISPLAY before issuing a PRINT command, or format not correct.

(b) Over use of facilities:

- Excessive TYPE
- Excessive EXPAND
- Excessive time spent in between commands.

(c) Correct, but poor use of facilities:

- unnecessary repetition of commands.
- "Excessive" null set generation.

4.3.6 Diagnoses

As was explained above, IIDA will "screen" the user's input, and diagnose his behavior. There exist two levels of such analysis:

- (1) At the first level, IIDA will recognize a syntactic error, that is, a query that DIALOG would not be able to recognize. The query is not sent, and the users is informed by IIDA of the error.
- (2) At the next level, IIDA will make a further analysis into the context of the input: for example, the strategy used during the search is observed, and if

"judged" nonproductive or inefficient by the system, IIDA will suggest variations. That is, IIDA will take an "intelligent look" at a query of the type: "Correct, but poor use of facilities", as described above. The system, once it has recognized the strategic errors, will offer some solutions in order to improve performances.

Here we can see that IIDA does not stop its services by issuing an "error message", but goes one step further by giving advice, indeed a unique approach. Meadow and his team had to define first what a "good strategy" was. From this definition, they gave rules adaptable to the system [Meadow, 79b].

The strategy of a typical search is derived from Penniman's cycle. David Penniman in his Ph.D. dissertation [Penniman, 75] describes one cycle as a pattern of repetitive commands such as: BEGIN, EXPAND/SELECT, COMBINE and PRINT in that order.

The number of each step varies, according to numerous factors, but the order is always respected within a cycle. If a search needs more than one cycle for completion, the set of "n" successive cycles determining a search, is called a string.

All the diagnostic capabilities in IIDA are based upon this

observation. (1) Most of the errors and warnings come from the observation of a broken cycle or from a cycle/string going over some predefined limits (size and number).

When IIDA receives an input, it first determines its validity. If the syntax is found correct (that is, DIALOG would recognize the input as a valid command), IIDA takes a look at the "strategy" used. A strategy found incorrect or inefficient will generate actions from the Warning Control Program (WCP), an important piece of software within the system. If called, the WCP will take one of the following actions:

(1) It will send an "error message" to the user. In the choice of wording, Meadow's team was very careful about using "neutral" messages, that is, messages which would not adversely strike the user. Indeed, an important consideration for casual users, when the reader realizes that most of the messages by "computers" are accusatory: the user did something wrong. Not a "friendly approach"!

(2) The WCP can defer the message. That is, if the user has just been warned of some actions, and he repeats

(1) Further developed by Oldrich Standera [Standera, 75].

it, IIDA will leave him alone. It is hoped that the user knows what he is doing. The first implementations of IIDA were going further in this direction, allowing the user to stop messages (type "/SLACK"), but such fancy requests are far from the casual users' casual needs.

- (3) A message can also be suppressed. For example, if an error generates a set of errors, only the "most important" will be selected, in order to simplify the corrective action.
- (4) A message can also be "enhanced", that is, complemented with relevant information. For example, if a message has been deferred "n" times, and finally released, the user could be informed that the message had been hidden from him "n" times.

Another important piece of software is the "help" library already mentioned. It allows quick advice (type "QA") as well as return to the exercise sessions. In fact, IIDA has the capacity of moving the user back to instruction level, if it is judged needed.

4.3.7 IIDA Conclusion

In this short presentation of IIDA, the author of this paper has tried to show some of the most interesting points offered by the system. The reader can see that IIDA presents much originality. However, the philosophy behind it, as well as many of the approaches are not new. On the contrary, Meadow obviously knew how to advance his system by using state-of-the-art work: thus Penniman's understanding of a cycle, CONIT's tables and parsing, as well as Caruso's TRAINER, all have been used to complete this remarkable tool, which has been successfully tested outside of "academia", by EXXON for example [Landsberg, 80].

4.4 CITE

The next example studied in this paper is an "Intelligent" approach to the same problem of a casual user wishing to access a retrieval system, with no external help.

CITE is an example of a system which can be queried in everyday English. The importance of such work can not be overemphasized, because if the efficiency and ease of use of such an interface can be demonstrated and extended to other systems, casual users could have their desires becoming reality.

4.4.1 Presentation

Since 1978, a user can access the National Library of Medicine's MEDLINE (Medical Literature Analysis and Retrieval Systems Online), using a natural language approach. The interface which allows this interesting approach is known as CITE, for "Correct Information Transfer in English". Queries are issued by the users under the original form of English sentences, paragraphs, groups (or lists) of terms or phrases which are compared to the set of titles, abstracts and controlled vocabulary of the system. The origin of CITE starts in 1978, with Doszkocs' designs of AID (Associative Interactive Dictionary), which allowed users to search the large bibliographic files of MEDLINE and TOXLINE, using queries in natural language. CITE evolved from this original approach [Doszkocs, 79].

In designing CITE, special attention was given to efficiency and quick response time. But, above all, the design of the language had to follow the following rules:

- (1) Assume that the user has no familiarity with the system.
- (2) Information will be solicited in a natural manner.

- (3) Try to prevent "frustration" on the part of the searcher [Doszkocs, 79].

4.4.2 Study of CITE

CITE proceeds by realizing a number of successive operations, represented in Figure 1 (page 51).

The steps are as follows:

- (1) The casual user enter his query in plain English.
- (2) The system recognizes search terms in the incoming input by matching the incoming string with a stopword list of 600 words, and indexes are retrieved by comparison to the MEDLINE inverted file. At this point, synonyms, various spellings and other variations are recognized, and unified under the controlled vocabulary selection.
- (3) The search terms are processed, and each one of them is assigned a weight. Pointers are adjusted to each reference, in order to minimize the processing time, if the same term is called again.
- (4) The user gets a display of a set of titles with a

weighted value of terms.

- (5) Relevance feedback, where the user selects the titles which he found relevant to his search from the complete set of titles retrieved is employed.
- (6) With PRINT, the user gets a full listing of the titles he is retrieving, and thus is given an idea of the path he is following.
- (7) Modification of the query in light of the items the user has judged "relevant" is performed.

1/ ENTER

ENTER QUERY

V

2/ IDENTIFY

RECOGNIZE
SEARCH TERM

V

3/ COMBINE

PROCESS
SEARCH TERM

V

4/ WEIGHT & RANK

DISPLAY
RANKED TITLE

V

5/ RELEVANCE
FEEDBACK

SELECT TITLE

V

6/ OUTPUT

PRINT
CITATIONS

OR

MODIFY
SEARCH

END

FIGURE 1 The CITE Cycle

4.4.3 CITE Conclusion

The approach of CITE is quite original. It is however difficult for the author of this paper to really judge the value of such an interface, because of the lack of literature available. For example, it is of first importance, for the critic, to have an idea of what the stoplist looks like, as well as the way the records are treated once they have been recognized.

If the system were to prove successful, nothing stops it from further expansion, as nothing in its design makes it exclusively designed for MEDLINE.

4.5 CCL

A Standard for Euronet-DIANE. A solution which seems important consider is the possibility of having some type of a "standard language" which would allow retrieval from different systems. If this Esperanto of Information Systems were to exist, the casual user would have to learn only one language.

4.5.1 Question of Standard

The problem with implementing a standard language is certainly not technological: it has already been done, and can

even be done quite efficiently. The most famous example, so far, is the Euronet-DIANE's Common Command Language (CCL). Euronet-DIANE is the result of a European effort to put together the wealth in information of the different European countries: the resulting databases would also gain if they were accessible through a unified language, on a single network. Many governmental and commercial organizations have accepted the proposal. Euronet has been operational since 1980. In 1983, 5 different European systems had accepted to implement the language CCL on their individual retrieval systems. They often choose to utilize "front-end" translators to modify their command languages, instead of separate computer interfaces.

4.5.2 Presentation

Unfortunately all that CCL has from "Common" is the first initial! And that is where the problem of standard language resides: those 5 systems have agreed to run a "common language," which, after only 2 years, has already evolved in two distinct subsets (1) [Verheijen-Voogd, 81]. The divergence between the two languages are quite small (mainly punctuation and use of symbols), but it is certainly enough to give a bad name to "Common Language" and headaches to the casual users.

(1) Those 2 languages are "IRS/ESA" and "DIMDI"

4.5.3 Problems in Standard

How Euronet-DIANE let itself be cornered in such a problem can easily be explained if the reader agrees to consider the following points, which are traditional difficulties in implementing standards: (1)

- (1) A standard will always be AGAINST current or past methods. In the case of languages, it is difficult to convince implementors and users that the new one will be better.
- (2) A standard is difficult to sell because it attacks some economic interests. Neither the commercial nor the governmental agencies see with pleasure the increased workload and cost resulting from implementing standards.
- (3) How can one be convinced which one is "better"? What is better, anyway? Better for one user, does not necessarily means better for all.
- (4) The size and advanced state of the current implementations make change difficult.

(1) Reference the social tragical comedy of the implementation of metric standards in the US!

In the case of Euronet, this last point should not have counted, but the other interests were too strong, and the "Community" now has at least 2 new languages to cope with!

5. REMAINING QUESTIONS

So far, this paper has shown different examples of realizations tending to simplify the access of retrieval systems to the casual users. Of course, there are many other approaches possible. In the following pages, the reader is invited to consider some aspects of the problem which have not been mentioned in the preceding pages.

5.1 New Technology

Studies in man/machine interface are taking increasing importance, since computer communication and information systems have been realized which not only seem to be getting increasingly more economical, but also more reliable and more responsive. This section is going to survey some of the interesting points which are being developed, and could, in a near future, simplify the casual user's access to retrieval systems.

5.1.1 Micro Computers and Smart Terminals

It is an easy guess to predict that within a near future much help will be directly given by the user's micro-computer. Already now, it is possible to access information retrieval systems through intelligent terminals or a micro-computer, and have those tools perform many redundant and annoying tasks. For example, there are many necessary "housekeeping" operations which are needed to access a system; it is necessary for the user to dial a network, issue an ID number, a password, an account number, the name of a database and a file ... All these operations are cumbersome and, because they are somewhat mechanical, they are very easily performed by a computer.

For example, a user could enter his name on his micro and call his favorite online system. Assuming that the modem is of the "smart" type (1), the user will have to wait patiently for the connection to be accomplished through the network to the system desired. Thus, it can be seen that micro-computers can take care of the login procedures, like the "Autocall" previously described did for CONIT's users. It makes sense to go one step further, and propose for the computer to allow a selection of

(1) Like the "Smartmodem" from Hayes, these modems transform character input into a phone number, and dial the number by themselves.

system. For the casual user, the only choice remaining would be to select the name of the desired system out of a menu.

Once online and ready to start, the user has to call a database. Some systems - like DIALOG - put the searcher, upon entering the system, within a default database; but the micro could easily, as a part of the login procedures, call a user-defined default. It is easy to imagine that the micro could insure some kind of interfacing, and help the casual user: in other word, a micro-IIDA!

Goldstein has shown [Goldstein, 78] how an interface could simplify the searching of a particular database (CATLINE) of a particular system (MEDLINE), by replacing the system language with a simpler one. His remarks can easily be generalized to other systems and other databases. Indeed, as this paper has previously shown, it would be interesting to implement some kind of "translators," where a user would be allowed to enter queries for any systems, using the system language he knows the best! (1)

The interface could also easily store repetitive queries and generate those streams upon requests. These mechanisms are now available in most systems. They can be implemented by the interface, giving the casual user an important advantage: he

(1) For example, accessing DIALOG, using ORBIT's queries

would have all the time he needs to build his queries and he would get to know "his" interface. Knowing the interface in this case could be more important than knowing the systems, since the queries would be directed to the interface.

Finally, and the most important point, the interface could "capture" the output. Instead of having the cycle:

Retrieve, Check, Print, Retrieve, Check, Print, Retrieve ...

until completion, or searcher exhaustion, a user's station could capture the data, copy the output into its memory (diskettes), and logoff. At this point, all the data is available to the user and ready for further processing. When the user is offline, he does not have the time pressure mentioned above. He will be able to edit, format, clean-up and select his output at his own convenience. If more information is needed, the user can renew the process. Note also that the exchange can easily be performed at 1200 baud or faster, instead of a slower output, required by reading online.

Another possibility is for the interface to transform the data. For example, a query to a database can give some output which the user would like to use as input for further queries. This transformation process could be realized by the interface,

with the double advantage that omissions and typographical errors are eliminated: all of the output can be transformed, and appear as a stream, in the same sequence as the output.

5.1.2 Graphics Interface

Even if it is not of first importance, as far as data retrieval is concerned, a report about man/machine interfaces can not be complete without a mention of graphical support. The exchange between user and machine has so far been restricted to conceptual and linguistic rules. However, the realization of such system as the LISA from Apple has shown the way toward new approaches.

Without pretending to judge the effectiveness or the necessity of such realization, the reader is invited to recognize the following trends, which are very likely to be further developed in the near future:

- (1) The concept of a user pointing to an image, a graphical representation of a concept instead of formulating rigid and/or lengthy queries.
- (2) The reduction of the amount of wordy dialogues: fewer terms for the user to memorize, type and correct.

- (3) Repetitive queries are widely used: the user is invited to transform existing modules instead of creating new dialogues from scratch.

All these attempts can help the casual user feel more comfortable in his search.

5.1.3 Other Ways

There exist many other examples of potential research, however, not at all necessarily applicable to data retrieval. The idea of moving a pointer across a screen in order to pin-point or select one item from a menu is certainly beneficial to the casual user. The "mouse" which helps the user in his path finding is also an issue which is well accepted, at least by the manufacturers... There are many other examples of new ideas: the US Air Force, for example, has equipped many of its bombers with devices on which the focusing of the pilot's eyes is translated into targets for its bombs... Thus the pilot's role is simplified to the visual selection from a screen.

5.2 Cost Factor

By building an interface, that is, by adding a new step to the process of retrieving data, a new factor is involved: the

cost factor. By this remark, reference is not only made to the cost of developing an interface, but also, the cost of executing it.

5.2.1 Development Cost

To be considered are the cost of writing the software, building the necessary hardware (like "friendly terminals"), the necessary extra storage (1) and the fact that the communication needs are often somewhat higher, sometimes doubled, since the communication is now not only between the user and the system, but between the user, the interface and the system. Also, by using an interface, many steps risk to be duplicated (i.e. parsing of commands, translation or interpretation of commands and messages, etc.).

Finally, if any "accessories" are used in order to help the user, such as a mouse or graphics, their cost will increase the global price for the user.

5.2.2 Usage Cost

On the other hand, the utilization of an interface can save a good amount of money, if the reader accepts the following

(1) For example, CONIT 3 requires at least 200K of storage.

points.

First, the original idea behind an interface was to eliminate, or at least to reduce the need of the professional searcher: an important savings on the payroll. Also, if the need for formal training can be diminished, and if the casual user can get a substantial satisfaction from the system, the interface can justify its role. It is the opinion of the author of this paper that if a user is satisfied by his search, he will use the search process more and more. By augmenting the usage, it is thought that the per-usage price of using retrieval systems will go down. Finally, it seems probable that, in the future, users of commercial systems will be billed not only for the time spent online, but also, or only, for the "usage time" (CPU time). This mode seems more "fair", and will probably appear in a near future. If, and when, this type of billing is installed, the casual user will get some financial advantages in using "counseling systems" such as IIDA.

5.3 Problems

Finally, the creation of an interface brings some problems which deserve further study. This paper has already noted the difficulties encountered by CONIT, which offers one interface for many classes of systems. An interface designed for one class of

user encounters the same problems, mainly because individual needs are different. An interface should be easily "by-passable". Also, the question of defining "how complete" or "how comprehensive" an interface should be, is a very difficult one to answer. By being absolutely perfect, and covering all cases, an interface runs the risk of being too slow for any user.

Other points worth considering are the facts that there exist some exceptional cases which are very important for a casual user, but so far have not been covered by any of the studies researched in this paper. Thus, if, during a search, a system failure occurs, it is likely that the casual user will be at a loss. The naive searcher is, without any doubts, going to think he did something wrong. And now what to do? That is a kind of traumatic experience which is worth being cured, before the user turns his back away from the retrieval process.

6. SUMMARY

This paper has studied some options available, in order to let casual users access multiple online retrieval systems with minimum difficulties.

One of the advantages of such an interface is that experimental research can (easily) be implemented at the

interface level. It is even possible to push the idea one step further, and recognize that modifications and enhancements of a retrieval system can be studied using the interface. The changes could be observed and tested on the interface as long as needed, and implemented on the main system only when fully satisfactory.

Users are very different in their needs, their behavior and their intellectual capacities, but the interface must be able to handle all of them. Thus:

- (1) The interface should be prepared to cope with any type of mistakes or any possible succession of mistakes.
- (2) Help should be available when necessary in precise and brief displays.
- (3) Users should be able to "fall back on their feet" after any important decision. For example, the system should come back to ask for confirmation before accepting any drastic changes.

It is important to keep in mind that users are human beings, and their expectations and their reactions should be well understood. For example, if the system is perceived once as unfriendly or difficult to use, it is very unlikely that the user

A S A

N A S A

will come back to it, unless obliged to do so. As Lancaster puts it: 'It is all too easy for the inexperienced user to become frustrated, and the once-frustrated user tends not to return to the system' [Lancaster, 72].

It is the problem that the 1980's are facing: the availability of technology is a great thing, if, and only if, it can be used by the people who need it. And that is a challenge which must be met with no delay.

DEMS.NASA/RECON-4

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MAN/MACHINE

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- [Marcus, et al, 81]. R.S. Marcus and F.J. Reintjes, "A Translating Computer Interface for End-User Operation of Heterogeneous Retrieval Systems II: Evaluation," Journal of the American Society for Information Science, pp. 304-316, July 1981.
- [Marcus 82]. R.S. Marcus, "Networking Information Retrieval Systems Using Computer Interface," Proceedings of ASIS, vol. 12, pp. 77-78.
- [Meadow, 79a]. C.T. Meadow, "Some Behavioral Similarities (Or Why the End User Will Eventually Take Over the Terminal)" Online, vol. 3, pp.49-52, January 79.
- [Meadow, 79b]. C.T. Meadow, "The Computer as a Search Intermediary," Online, vol. 3, pp. 54-59, July 79.
- [Miller, et al, 77]. L.A. Miller and J.C. Thomas, Jr., "Behavioral Issues in the Use of Interactive Systems," International Journal of Man-Machine Studies, vol. 9, pp. 509-536, 1977.
- [Oddy 77]. R.N. Oddy, "Information Retrieval Through Man-Machine Dialogue," Journal of Documentation, vol. 33, no. 1, pp. 1-14, March 1977.
- [Penniman, 75]. D.W. Penniman, "Rhythms of Dialogue in Human Computer Conversation," Ph.D. dissertation, The Ohio State University, Columbus, 1975.
- [Pollitt, 81]. A.S. Pollitt, "An Expert System as an Online Search Intermediary," Proceeding of the 1981 International Online Meeting, London, pp. 25-32, Dec 7, 1981.
- [Radhakrishnan, et al, 82]. T. Radhakrishnan, C. Grossner, and M. Benoliel, "Design of an Interactive Data Retrieval System for Casual Users" Information Processing & Management, vol. 18, no. 1, pp. 23-32, 1982.
- [Reisner, 77]. P. Reisner, "Use of Psychological Experimentation as an Aid to Development of a Query Language," IEEE Transactions on Software Engineering, vol. SE-3, no. 3, pp. 218-229, May 1977.
- [Standera, 75]. O. Standera, "Online Retrieval System: Some Observations on the User Systems Interface," Proceedings of the 38th ASIS Meeting, Washington, D.C., 1975.

- [Smith, 76]. L.C. Smith, "Artificial Intelligence in Information Retrieval Systems," Information Processing & Management, vol. 12, pp. 189-222.
- [Toliver, 81]. D. Toliver, "A Program for Machine-Mediated Searching," Information Processing & Management, vol. 17, pp. 61-68, 1981.
- [Verheijen-Voogd, 81]. C. Verheijen-Voogd, "Is EURONET CCL A 'Common' Command Language?" Online Review, vol. 5, no. 5, pp. 399-401, October 1981.
- [Wanger, 79]. J. Wanger. "Education and Training for Online Systems," Annual Review of Information Science and Technology, vol. 14, pp. 219-245, 1979.

ATTACHMENT 4.6

**"KNOWLEDGE-BASED SYSTEMS:
A PRELIMINARY SURVEY OF SELECTED
ISSUES AND TECHNIQUES," SRINU KAVI,
USL/DBMS NASA/RECON WORKING PAPER SERIES
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D E M S . N A S A / R E C O N - 5

W O R K I N G P A P E R S E R I E S

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KNOWLEDGE BASED SYSTEMS :
A PRELIMINARY SURVEY
OF
SELECTED ISSUES AND TECHNIQUES

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May 31, 1984

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KNOWLEDGE-BASED

ABSTRACT

It is only recently that research in artificial intelligence (AI) is accomplishing practical results. Most of these results can be attributed to the design and use of expert systems (or Knowledge-Based Systems, KBS) - problem solving computer programs that can reach a level of performance comparable to that of a human expert in some specialized problem domain. But many computer systems designed to see images, hear sounds and recognize speech are still in fairly early stage of development.

In this report, a preliminary survey of recent work in KBSs is reported, explaining KBS concepts and issues and techniques used to construct KBS. Application considerations to construct KBSs and potential research areas in KBSs are identified. A case study (MYCIN) of a KBS is also provided.

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 Within this report, certain survey sections are based heavily on state-of-the-art research reported on by other authors. Such section titles within the report are followed immediately by cited references indicating that credit for the contents of the entire section is due to the cited author(s).

KNOLEDGE BASED SYSTEMS:
A PRELIMINARY SURVEY
OF
SELECTED ISSUES AND TECHNIQUES

1. INTRODUCTION

It is only recently that artificial intelligence (AI) - that branch of computer science that attempts to have machines emulate intelligent behavior - is accomplishing practical results. Most of these results can be attributed to the design and use of expert systems (or Knowledge-Based Systems, KBS) - problem solving computer programs that can reach a level of performance comparable to that of a human expert in some specialized problem domain [Nau, 83].

This project report surveys recent work in KBS, explaining KBS concepts and issues.

2. KNOWLEDGE-BASED SYSTEMS (KBS)

It is necessary to distinguish, at the outset, between knowledge-based systems and other computer-based systems that contain or incorporate knowledge. Almost all computer programs

and systems contain knowledge of at least two kinds: knowledge about things and knowledge about what to do with things - that is, how to manipulate or transform them. Davis [Davis, 77] defines the KBS in the following way: 'A knowledge-based system is one in which knowledge is collected in one or more compartments (called knowledge sources) and is of the kind that facilitates problem solving (reasoning) in a single, well-defined problem domain.'

Problems are solved by applying the kind of reasoning that is used by a practitioner in the domain in which KBS is applied. Unlike generalized problem solving system, KBS must accumulate large amounts of knowledge in a specific domain and rely on domain-specific problem solving techniques that can be developed to a high level of expertise [Davis, 77].

In building such systems, researchers have found that amassing a large amount of data rather than sophisticated reasoning techniques is responsible for most of the power of the system. Such expert systems, previously limited to academic research projects, are beginning to enter the software market place [Gevarter, 83]. Some of the application areas where KBS are used are:

- (1) Medical diagnosis.
- (2) Mineral exploration.
- (3) Oil-well log interpretation.
- (4) Chemical and biological synthesis.
- (5) Military threat assessment.
- (6) Planning and scheduling.
- (7) Signal interpretation.
- (8) Air-traffic control.
- (9) VLSI design.
- (10) Equipment fault diagnosis.
- (11) Speech understanding.
- (12) Space defence.
- (13) KB access and management.

Table 2-1, taken from [Nau, 83], lists few of the existing systems developed for some problem areas. More extensive lists can be found in [Gevarter, 83].

In addition to these systems, some compiler languages are being developed to provide tools for creating knowledge-based systems: AGE [Nii, 79], ARS [Stallman, 77], KRL [Bobrow, 77], OPS [Forgy, 77].

Speech-understanding systems developed at CMU (among other places) are not included in this survey [Stefik, 77; Reddy, 73; Reddy, 75]. This is because they are more complex and more of research prototypes, yet many of the techniques they embody are incorporated in systems discussed in this report.

Table 2-1 SOME EXISTING EXPERT SYSTEMS [Nau, 83]

SYSTEM	EXPERTISE
AQ1	Diagnosis of Plant Diseases
CASNET	Medical Consulting
DENDRAL	Hypothesizing Molecular Structure from Mass Spectrograms
DIPMETER ADVISOR	Oil Exploration
EL	Analyzing Electrical Circuits
INTERNIST	Medical Consulting
KMS	Medical Consulting
MACSYMA	Mathematical Formula Manipulation
MDX	Medical Consulting
MOLGEN	Planning DNA Experiments
MYCIN	Medical Consulting
PROSPECTOR	Mineral Exploration
PUFF	Medical Consulting
R1	Computer Configuration

Before we go to next section, I think it's appropriate to "define" knowledge. The following is taken from [Wiederhold, 84]. Widerhold observes that:

- (1) Knowledge considers general aspects of data.
- (2) Knowledge is significantly smaller than data.
- (3) Knowledge does not vary rapidly (compared to data).

Widerhold gives some simple examples to illustrate the difference between knowledge and data:

Mr. Lee's age is 43 years	- Data
Middle-age is 35 to 50	- Knowledge
People of middle-age are careful	- Knowledge
Mr. Lee has never had a traffic accident	- Data

2.1 A Hypothetical KBS

The following is a brief description and example of a simple, hypothetical KBS application that illustrates most of the capabilities of a KB system. This is mostly based on [Davis, 77].

The hypothetical system is an automotive service consultant whose primary purpose is to help ensure the best service at the least cost for automobiles brought to a service agency. The system is to be used both by the service representative, who is the primary interface between the customers and the company, and by the mechanics who work on the cars. . Although the reasoning skills required by such a KB system are relatively simple, the amount of knowledge required (exclusive of the normal data base) is large because of the number and variety of automotive subsystems involved and the high degree of their interdependence.

The data base of the system would contain a description of each car serviced at the agency. The description would contain the configuration of the vehicle's engine, running gear, and optional and special equipment as well as the year of manufacture, model, color, service history, etc.

The system would contain two basic kinds of knowledge:

- (1) Generic knowledge about the major elements of the vehicle (such as its cooling, ignition, and fuel systems).
- (2) Knowledge about the model and its specific options.

Diagnostic knowledge would be necessary to relate symptoms to causes and to relate specific knowledge to generic knowledge. For instance, poor engine performance could result from mechanical problems (valves, rings) or from related systems (cooling, ignition, or carburetion).

The intent of the system is to recommend:

- (1) The least expansive tests that will produce the greatest amount of specific information about the cause of the problem.
- (2) The least expensive repairs for the problem.
- (3) The best post-repair testing to verify that the problem is solved.

The following is a hypothetical scenario of such a system in operation. The users are the service representative and the mechanic(s) performing the test and repair work. The user

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language is a stylized English designed to convey a maximum amount of information between the user and the system with a minimum amount of effort.

System: Tuesday, May 3, 1977, 08:32:44

Service rep: Next customer

System: Enter owner's name or vehicle ID number

Service rep: 1743 HBAQ 8197

System: Owner is S.B. Franklin, car is 1974 Ford Gran Torino 4-dr sedan with 351-2V engine, A/C, P/S, P/B and CA smog controls. Last service - April 4, 1977 at 28,412 mi R&R water pump and lower radiator hose, what is present mileage?

Service rep: 29285

System: Please inform owner that the following regular maintenance services are due:

Change oil and filter - last changed on Jan 13, 1977 at 24,842 mi.

May we be of other service?

N A S A

N A S A

Service rep: Battery not keeping charge, barely able to start car this a.m.

System: Any other symptoms or problems?

Service rep: No

System: Check belt tension on alternator - most likely cause.

Service rep: Why?

System: Last service required removal of fan and belts, very likely that tension was not properly set on reinstallation.

Service rep: More (meaning more things to be checked or tested)

System: Check fluid level in battery - next most likely cause - overcharged battery. If level is low, check alternator output and voltage regulator.

Service rep: Replace battery?

System: No, battery is 6 mos old and should take recharge.

N A S A

N A S A

Service rep: Thank you. (Signal to system that session is ended for now)

System: Car assigned number 287 in control system. First test to be performed by J.K. Uzzi in Bay 17.

After the car is moved to the mechanic's work area and the prescribed tests are performed, the following interchange takes place between the mechanic and the system:

Mechanic: JKU 17, 287 (indicating mechanic, bay and car being serviced)

System: 1974 Gran Torino, test results please.

Mechanic: Belt tension OK, battery level OK, charge low, alternator, VR output OK. Problem not found.

System: Test for above-normal current flow with ignition off. (Mechanic attaches ammeter and takes reading).

Mechanic: Reading above normal.

System: Check for faulty switch in hood light, trunk light, and courtesy lights.

Mechanic finds faulty switch in trunk light such that light never turns off.

Mechanic: Fault trunk light switch R&R. Current reading normal.

What specific knowledge must such a system incorporate in order to diagnose and suggest remedies? The knowledge must come from experts who have acquired and demonstrated diagnostic skills. For the system to have suggested checking the belt tension of the alternator, it would have to know that the earlier removal of the belt could be related to the present problem, that the severity of the problem would depend on how poorly the tension was adjusted, and that one month and about 900 miles before appearance of symptoms (battery failure) is not unreasonable. Since it is a highly probable cause and the easiest to test, it ranks as the first suggestion. By requesting more information, the service representative can tell the owner what else may be required and what will not likely be required, such as a new battery.

Even though this is an hypothetical system, functionally it is similar to many successful KB systems existing today. Of course, those systems solve more difficult problems in the sense that the reasoning chains may be longer. The knowledge, however,

is of a similar variety, and the interactive discourse has the same flavor of naturalness.

2.2 KBS Components

A knowledge-based system is one that supports practitioners in a specific knowledge domain by incorporating the knowledge acquired from experts in that domain and applying it, in combination with certain reasoning skills, to the solution of problems posed by the practitioners. In other words, a KBS functions as an intelligent assistant - a substitute for the expert human consultant who may be needed but unavailable. A KBS may produce solutions or explanations that are more thorough than those produced by a human expert, and may produce them more rapidly [Gevarter, 83]. However, the human has imagination and the capacity for innovation which even the most expert KBS does not have.

A KBS is composed of three components or modules:

- (1) An interface.
- (2) A cognitive engine.
- (3) A knowledge base (Figure 2-1).

The knowledge base - the passive element in the system - contains the knowledge sources and fact files.

The cognitive engine drives the system. It performs the system's problem solving (inference-making or reasoning) operations. It applies the knowledge in the knowledge sources and uses the fact files in the knowledge base to answer questions or solve the problem posed by the user.

The interface provides interactive communication between the user and the system. It allows for the acquisition of data in a variety of forms - a real-time signal, a file of observations, data provided by the user, etc, and for the addition or modification of knowledge in the knowledge base.

As already mentioned above, a KBS acts as a special-purpose "intelligent agent" on behalf of its user; it is not a general-purpose problem solver. It provides supportive knowledge in a well-defined, clearly bounded problem domain. No present-day KBS is intended for use by a casual, inexpert user.

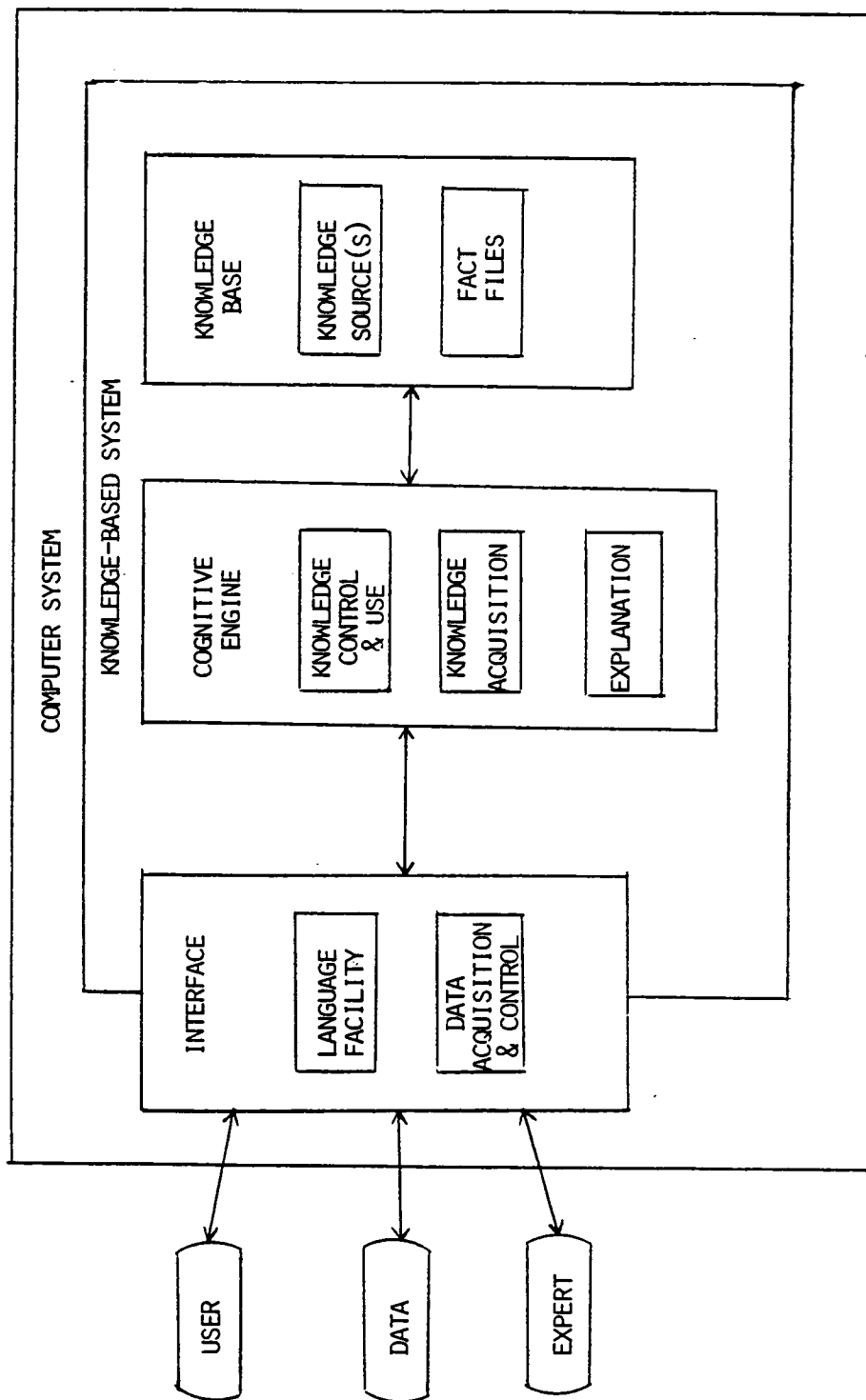


FIGURE 2.1 KBS ELEMENTS AND THEIR RELATIONSHIP

2.3 Knowledge Base

As already mentioned, the Knowledge Base (KB) is a passive element of KBS. Though passive, the KB determines the performance and utility of the KBS, because the Cognitive Engine (CE) (see Section 2.4) depends on the knowledge in the KB. In this section, the characteristics of the KB that are common to many of the KB systems (that I studied) are described.

The KB of a KBS may contain both Knowledge Sources (KSs) and fact files. The fact files that are contained in a KB are equivalent to a data base in that they contain attribute values and the equivalent type of information that may be required for the complete solution of a problem. A collection of fact files without a Knowledge Source is not a KB. A Management Information System constructed from a conventional data-management system is not a KBS because it does not have reasoning or inferencing capability.

A KS contains what is usually called knowledge. Multiple KSs are usually necessary when there are multiple "levels" of knowledge, such as problem-specific knowledge and knowledge (often called Meta-knowledge) about how the CE can best use the problem-specific knowledge. Since the two kinds of knowledge are

used for different purposes, it is reasonable to keep them in different KSs. It is also often true that more than one kind of problem-specific knowledge is acquired from different experts and that there is no efficient single method for representing all of the knowledge. Since different representations are needed, separation into separate KSs is logical.

The knowledge of the KSs is usually of the following types [Shortliffe, 76; Davis, et.al, 77; Nau, 83]:

- (1) Methods for specifying cause-effect relationships, implications, or inferences, using production rules, predicate-calculus expressions, or other logical representations, depending on the richness of the relationship to be represented.
- (2) Plans of action for how one would achieve an end result in the world external to the model that the system represents. For instance, such a procedure may describe how to transform one chemical compound into another for a chemical-synthesis system, or how to purify an intermediate compound.
- (3) Declaratives that identify objects within the modeled domain and distinguish them from objects that are not

within the domain. These declaratives may describe properties of objects, relationships among objects, definitions of terms or constructs, schemata that identify the legal relationships or transformations applicable to the domain, etc.

(4) Meta-properties, which are a higher level of abstraction about the domain and the solution space and methods. They take the form of meta-rules - that is, rules about using the knowledge in types (1), (2), and (3) above. They provide a means for determining and assuring the consistency, coherency, and reliability of intermediate results and steps as well as the final solution and answers. They may also restrict the solution space in various ways (such as pruning and ordering a "move" tree) that markedly improves the efficiency of the system.

(5) Advice (sometimes called heuristics) that is similar to meta-properties in intent, but that does not carry the same strength of influence. Advice may be a hint to the CE as to what knowledge is best to use next or how to escape from a possible blind alley or what is the most likely transformation that will yield a useful result.

There are a variety of techniques that have been used to represent KSs with these characteristics [Feigenbaum, 81]. They will be described in detail in Chapter 3.

2.4 Cognitive Engine

The Cognitive Engine (CE) combines and organizes the contents of the KB in inference or search structures in order to perform plausible or common-sense reasoning about the domain as it applies to the problem posed by the user. The intent of the CE is to focus the effort as narrowly as possible on the problem at hand.

The CE provides the central control of the KBS. How the CE does this affects both the power and the performance of the system, but is not the sole determinant. A KBS's ability to solve a particular problem depends on:

- (1) How many paths there are to a solution.
- (2) The ability of the Cognitive Engine to reduce the number to a minimum.
- (3) The knowledge in the Knowledge Base.
- (4) What information is available within the problem

statement.

Therefore, although the Cognitive Engine is in command and acts as the driving element, the path to a solution, and the criteria for when to accept a solution or abort a particular path are highly dependent on the content of the KB and the problem data.

To qualify as a KBS, a system should possess the potential for explaining its actions and reasoning processes with respect to an interaction with the user or to a solution it produces. This is another function of the Cognitive Engine. Explanations are given in terms of the content of the KB, the problem data and prior interactions with the user and are related only to past activity; the system cannot explain how it might deal with a hypothetical case or how it will continue in solving a present problem.

The CE must also provide the mechanisms that facilitate the acquisition of new knowledge, the modification of existing knowledge, and deleting erroneous or useless knowledge - all of which are done in cooperation with an expert. A KBS does not generally permit its users to make permanent additions or changes to the Knowledge Base.

The knowledge contained in the CE may be general or

meta-knowledge about how to reason (infer or search) as well as domain-specific problem-solving knowledge. The ultimate decision about what kind and what level of knowledge to incorporate in the CE depends on the intent of the system and the complexity of the domain, as well as on considerations about performance, efficiency, growth, and so on.

In summary, the CE is the controlling, active element of the KBS that directs the problem-solving activities, explains the system's behavior to its users upon request, and manages the Knowledge Base.

Some of the techniques of CE are described in Chapter 3.

2.5 Interface

The interface is the communication port between the system and the external world. As such, it provides three functions:

- (1) Interaction with the user (i.e., accepting input and returning results, explanations, or other output often in English or a stylized natural language of the domain).
- (2) Addition of knowledge to the KB by a domain expert.

- (3) Acquisition by the KB of problem data.

These functions are explained in more detail below:

- (1) The User Interface should accommodate the jargon specific to the domain of the KBS and may permit a natural language. It provides the necessary facilities for the user as a poser of problems and a consumer of results (answers, explanations). It is not the port through which expert knowledge is entered into the system, nor is it intended to support casual, inexperienced users.
- (2) The Knowledge-Acquisition (Expert) Interface is used by a domain expert (who has gained some feeling for the system) as the provider of knowledge for the KSs. Associated with the Knowledge-Acquisition Interface is some means of verifying the incoming knowledge, sometimes limited to syntax checking, but often including tests for coherence and consistency with prior knowledge both in the KSs and the CE [Shortliffe, 76]. It is possible that the KA Interface and the User interface use some system components in common, but they are considered

logically separate.

(3) The Data Interface is more conventional than the other two. It is similar to that of most other interactive computer systems, in that it incorporates:

- (a) Facilities for user input of data and responses to the system's queries.
- (b) The mechanism for locating and accessing files and data bases.

Many of the functions necessary to provide the Data Interface may be drawn directly from the computer-system environment within which the KBS functions.

Separation of KBS Elements

The separation of the elements of a KBS is a necessary condition for including a system in that category, since it permits the changing of the domain of application by extending, expanding, or substituting another KB independently of the CE. One example: EMYCIN (for Empty MYCIN) is the CE of MYCIN [Davis, et.al, 77] (also see Appendix A), to which several different KBs have been experimentally attached for solving different classes of problems. Still there is no general theory of knowledge-based systems complete enough to permit the facility of substituting a

KB from a different domain as a means of creating a new KBS for that domain.

Even though it was mentioned that a KBS must have a CE or a KB, in most of the systems they are not so easily identifiable.

2.6 Summary

In summary, to qualify as a KBS, a system must:

- (1) Be externally invoked by an expert in the domain of applicability.
- (2) Have an identifiable CE that reasons plausibly using the KB and whose solution path is controlled by the content of the KB and problem data.
- (3) Have the potential for explaining its behavior.
- (4) Have an identifiable KB that contains expert domain-specific knowledge (this is the most critical aspect of a KBS).
- (5) Be organized and structured so that its KB can be expanded and extended and the system's performance improved.

3. TECHNIQUES USED TO CONSTRUCT KBS

Artificial Intelligence (AI) techniques are widely used in KBS. In addition to AI, several other computer science areas have developed techniques that are used in the construction of KBS. A partial list of the major contributions are summarized in Figure 3-1.

The following subsections discuss KBS technologies grouped according to function. Section 3.1 describes the methods used to represent the knowledge contained in the Knowledge Sources (KS). Section 3.2 describes the methods used to model and represent the work-space - the dynamic state of a system during its problem-solving activity. Section 3.3 describes techniques that are used to construct the Cognitive Engine (CE). Section 3.4 describes the techniques used to build the interface between the KBS and the user.

Table 3-1 ORIGINS OF KBS TECHNIQUES
(Based on [Hayes-Roth, 83])

ARTIFICIAL INTELLIGENCE (AI)

- Hueristic Search
- Inference and Deduction
- Pattern Matching
- Knowledge Representation and Acquisition
- System Organization

LANGUAGE PROCESSING

- Parsing and Understanding
- Question and Response Generation
- Knowledge Representation and Acquisition

THEORY OF PROGRAMMING LANGUAGES

- Formal Theory of Computational Power
- Control Structures
- Data Structures
- System Organization
- Parsing

MODELING AND SIMULATION

- Representation of Knowledge
- Control Structures
- Calculation of Approximations

DATA BASE MANAGEMENT

- Information Retrieval
- Updating
- File Organization

3.1 Knowledge Representation

In contrast to conventional database systems, KB systems require a knowledge base with diverse kinds of knowledge - knowledge about objects, about processes, and hard-to-represent common sense knowledge about goals, motivation, causality, time, actions, etc. Attempts to represent this breadth of knowledge raise many questions [McCalla, et.al, 83]:

- (1) How do we structure the explicit knowledge in a knowledge base?
- (2) How do we encode rules for manipulating a knowledge base's explicit knowledge to infer knowledge contained implicitly within the knowledge base?
- (3) When do we undertake and how do we control such inferences?
- (4) How do we formally specify the semantics of a knowledge base?
- (5) How do we deal with incomplete knowledge?
- (6) How do we extract the knowledge of an expert to initially "stock" the knowledge base?

- (7) How do we automatically acquire new knowledge as time goes on so that the knowledge base can be kept current?

In this section we describe some of the techniques used to represent such kinds of knowledge.

3.1.1 Knowledge Representation Forms [Feigenbaum, 81]

A knowledge source may assume several different forms of representation through a KBS. The domain expert imparts new knowledge to the knowledge acquisition mechanism in the external form. The acquisition mechanism transforms or compiles the external representation into the physical form and merges the new knowledge into the appropriate KS. The physical form is a data structure such as a matrix, list, or n-tuple, or a procedural representation, or some combination of these forms. When another component of the system (such as the CE) accesses the KS, the logical form is used at the interface. The logical form defines the set of questions that can be answered immediately by the KS. Finally, knowledge is transformed back into the external form when the system provides explanations to the user. Figure 3-2 summarizes the transformations of knowledge representations throughout a KBS.

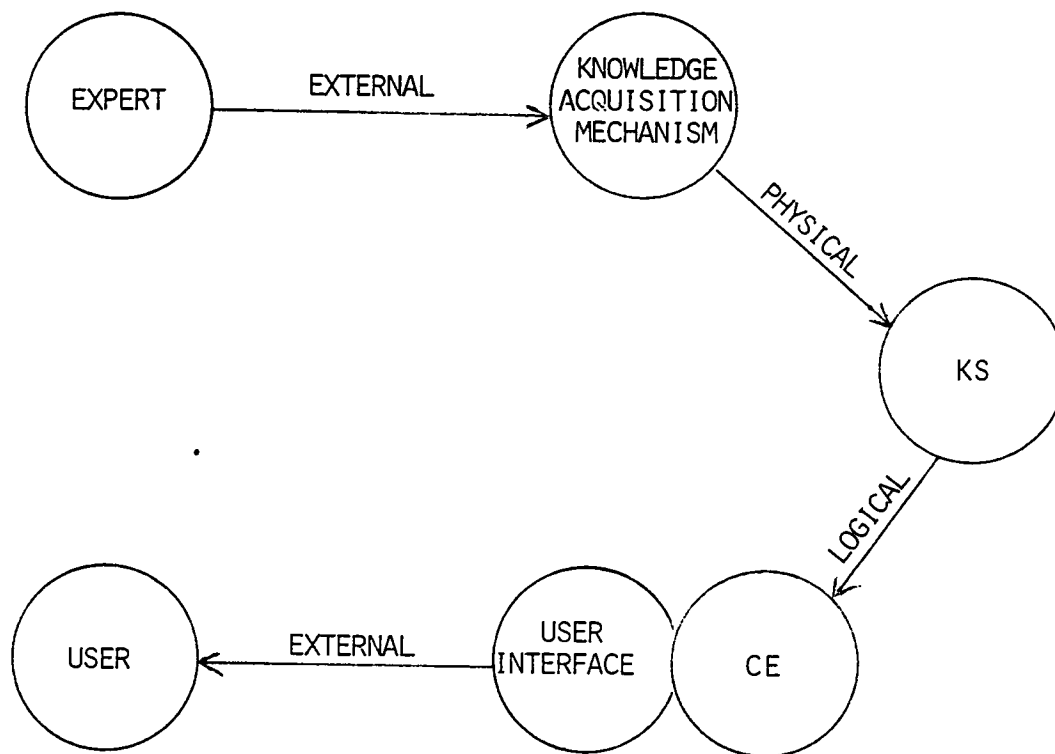


FIGURE 3.2 KNOWLEDGE REPRESENTATION FORMS

There are two important terms/concepts in knowledge representation [Feigenbaum, 81].

Knowledge Chunks. Both the external and logical knowledge representation format are partially characterized by the term chunk size. A knowledge chunk is a primitive unit in the representation - that is, in a KS that contains the definitions of several interrelated terms, the definition of a single term is a "chunk". The knowledge chunk is the unit by which the expert augments (or modifies) the KS. The simplest action that can be taken by the CE is to apply or use a single chunk. Chunk size of knowledge is an important consideration to KBS technology for three reasons:

- (1) It determines the level at which the expert can instruct the system. If the chunk size is either too large or too small, the expert is forced into an unnatural mode of expressing his knowledge.
- (2) It in part determines the acceptability of the system's explanation mechanism. Since the knowledge chunks used to derive and support the system's conclusions form the essential part of explanations, acceptability is enhanced when the chunks are the same

size or level of detail used by one worker in the application field describing results to another worker in the same field.

- (3) It determines the kinds and efficiency of reasoning techniques to be used in the KBS. Larger chunk sizes generally permit shorter lines of reasoning. For that reason, they are more likely to lead to a correct conclusion when inexact but plausible inference techniques are used.

Credibility Factors [Shortliffe, 76]. All of the knowledge in a KS need not be true in an axiomatic sense. Much of the content of a KS may be "rules of thumb" and working hypotheses. This raises the issue of how a system is to use knowledge of this sort to produce acceptable results. In many KB systems, the chunks in the KS are rated as to their credibility by the experts who entered them into the system. This rating is then available to the CE as a guide in the reasoning process.

There are at least four possible meanings or interpretations of credibility factors:

- (1) A probability: the fraction of the time the chunk is true.

- (2) Strength of belief: how certain is the expert that the chunk is always true?
- (3) Acceptability: is this a preferred method or fact to workers in the field?
- (4) Relevance: what is the probability that use of this chunk will ultimately lead to a completed chain of reasoning that solves the problem at hand?

It is essential that the kind of credibility factor that is to be used be stated and agreed upon by the expert who instructs the system and by the programmer who builds the CE.

Additional references include the following: [Tversky, 72; Zadeh 75a; Zadeh 75b; Goguen, 68].

3.1.2 Methods of Representing KS [Feigenbaum, 81]

Some of the methods of representing a knowledge source:

- (1) Finite-state machine.
- (2) Programs.
- (3) Predicate calculus.

- (4) Production rules.
- (5) Semantic networks.
- (6) Frames.
- (7) Conditional probabilities.

In this report I will describe only production rules, semantic networks and frames. The other methods will be discussed in a subsequent report.

3.1.3 Production Rules [Feigenbaum, 81]

Production rules have been used as the principal method of representing knowledge in many (if not most) of the highly successful KB systems - for example, MYCIN and DENDRAL.

A production rule is a specification of a conditional action. It consists of a left hand side (LHS), also called the condition or the antecedent, which describes a situation, and a right hand side (RHS), also called the action or consequence, which describes something that may legally be done in a situation described by the LHS.

For example, in "If you are outdoors and it is raining, then open an umbrella". The conditions are 'being outdoors' and

'rain'. The action is to open an umbrella.

Production system is a three-component entity:

- (1) A collection of production rules.
- (2) A workspace.
- (3) A control mechanism.

The production rules are represented by some agreed-upon syntax, by means of which the LHS and RHS are built up from a set of primitives and symbols that correspond to objects, functions, and predicates in a domain. The workspace contains the total description of the system's current state or situation. The LHS of a rule describes, or is matched against, the contents of the workspace. If a production is applied, i.e., its LHS matches and its RHS is executed, then the RHS actions modify the workspace.

The control mechanism has two parts. The first part builds the conflict set - the set of all production rules whose LHSs are satisfied. If the conflict set is empty, then processing is terminated, and the result is the contents of the workspace. However, if the conflict set is not empty, then the conflict-resolution strategy selects one member of the conflict set and the RHS of the selected production rule is executed.

Several conflict-resolution strategies have been used or proposed.

Rule order - There is a complete ordering of all production rules. The rule in the conflict set that is highest in the ordering is chosen.

Rule precedence - A precedence network determines an ordering.

Generality order - The most specific rule is chosen.

Data order - Elements of the workspace are ordered. The rule chosen is the one whose LHS references the highest-ranking workspace element(s).

Regency order - Execute the rule in the conflict set that was most (least) recently executed, or the rule in the conflict set whose LHS references the most (least) recently referenced element(s).

Non-deterministic - Execute every rule in the conflict set as if it were the only member. Computation stops when any path terminates.

3.1.4 An Example

The example is a production system that assists the service manager and mechanics in an automobile repair agency (refer back to Section 2.1). The scenario for using this system is the arrival of a customer at the agency. He reports the symptoms and problems to the service representative, who then enters this information into the system. The system has at its disposal a data base of past problems, repairs and services performed on the vehicle, and a KS of production rules that describe cause-and-effect relationships among the performance characteristics and measurable attributes of an automobile. Using the reported information, the past-history data base, and the KS, a diagnostic and repair plan is formulated and implemented.

Figure 3-3 gives a few of the production rules that might be present in such a system. Each rule is named; however, the rule names are used only for convenience. The format of the rule is:

```
IF lhs1 C1 lhs2 .... Cn-1 lhsn
THEN rhs1[p1] K1 rhs2[p2] .... Km-1 rhsm[pm]
```

- R1 IF fan belt tension is low
 THEN alternator output will be low [.5] and engine will
 overheat [.2]
- R2 IF alternator output is low
 THEN battery charge will be low [.7]
- R3 IF battery is low
 THEN car will be difficult to start [.5]
- R4 IF automatic choke malfunctions OR automatic choke
 needs adjustment
 THEN car will be difficult to start [.8]
- R5 IF battery is out of warranty
 THEN battery charge may be low [.9]
- R6 IF coolant is lost OR coolant system pressure cannot be
 maintained
 THEN engine will overheat [.7]
- R7 IF there is a high resistance short AND fuse is not
 blown
 THEN battery charge will be low [.8]
- R8 IF battery fluid is low
 THEN battery will boil off fluid [.3]
- R9 IF battery fluid is low
 THEN battery charge will be low [.4]

Figure 3-3 PRODUCTION RULES FOR AUTOMOTIVE SYSTEM KS

where the C1 and K1 are the connectives AND or OR. The LHS is everything between the keywords IF and THEN, and the RHS is everything following the THEN. Each lhs(i) is an observable or measurable condition predicate, e.g., that the tension of the fan belt is low or the engine is overheating. Each rhs(i)[p(i)] is a condition, rhs(i), that will follow with certainty or probability, p(i). Thus rule R1 says that, if the tension of the fan belt is low, then there are two possible consequences:

- (1) That about one-half of the time the output of the alternator will be low.
- (2) About one-fifth of the time the engine will overheat.

The other production rules, R2-R9, are interpreted in a similar manner.

A fact file in the system is shown in Figure 3-4. The information included for each observation or measure is the agent from whom to gather data and the relative difficulty (or cost) of gathering the data.

OBSERVATIONS	AGENT	DIFFICULTY
Alternate Output Level	Mech	4
Battery Charge Level	Mech	3
Battery Fluid Level	SrvR	2
Choke Adjustment	Mech	5
Choke Function	Mech	5
Coolant Level	SrvR	2
Coolant System Pressure	Mech	5
Difficulty to Start	Cust	1
Engine Temperature	Cust	1
Fan Belt Tension	Mech	3
Fuse Condition	SrvR	2
Short in Electric System	Mech	8
Voltage Regulator Level	Mech	4
Warranties	Data Base	0

Figure 3-4 DATA GATHERING PROCEDURE FACT FILE

There are four possible agents for data gathering:

- (1) The customer (Cust).
- (2) The historical data base
- (3) Inspection by the service manager (SrvR).
- (4) Measurement by the mechanic (Mech).

The difficulty information will be combined with the confidence factors in the production rules to formulate the most cost-effective and timely plan for the needed diagnostics and repairs.

Assume that a customer arrives at the agency with the vague complaint that his car is hard to start. The service manager enters this information, including appropriate customer and vehicle identification. The system then grows a structure similar to that shown in Figure 3-5. The boxes are labeled with observable or measurable symptoms and are connected by arrows labeled with the names of the production rule they represent. To the far right of each of the unknown values (e.g., the box labels, such as battery-fluid level), the associated agent and relative difficulty are listed. At this point, the system would check the data base for information about the battery's warranty. If nothing decisive was found, then the customer would be asked whether the car was running hot, and the service manager would

continue to make on-the-spot observations. Diagnostic procedures for causes not ruled out by the procedure to date would then be placed on an ordered schedule for a mechanic.

The ordering would be based upon:

- (1) Cost effectiveness - a function of test difficulty, estimated probability of being necessary, and ability to eliminate other tests.
- (2) Availability of resources - speciality mechanism and test equipment.

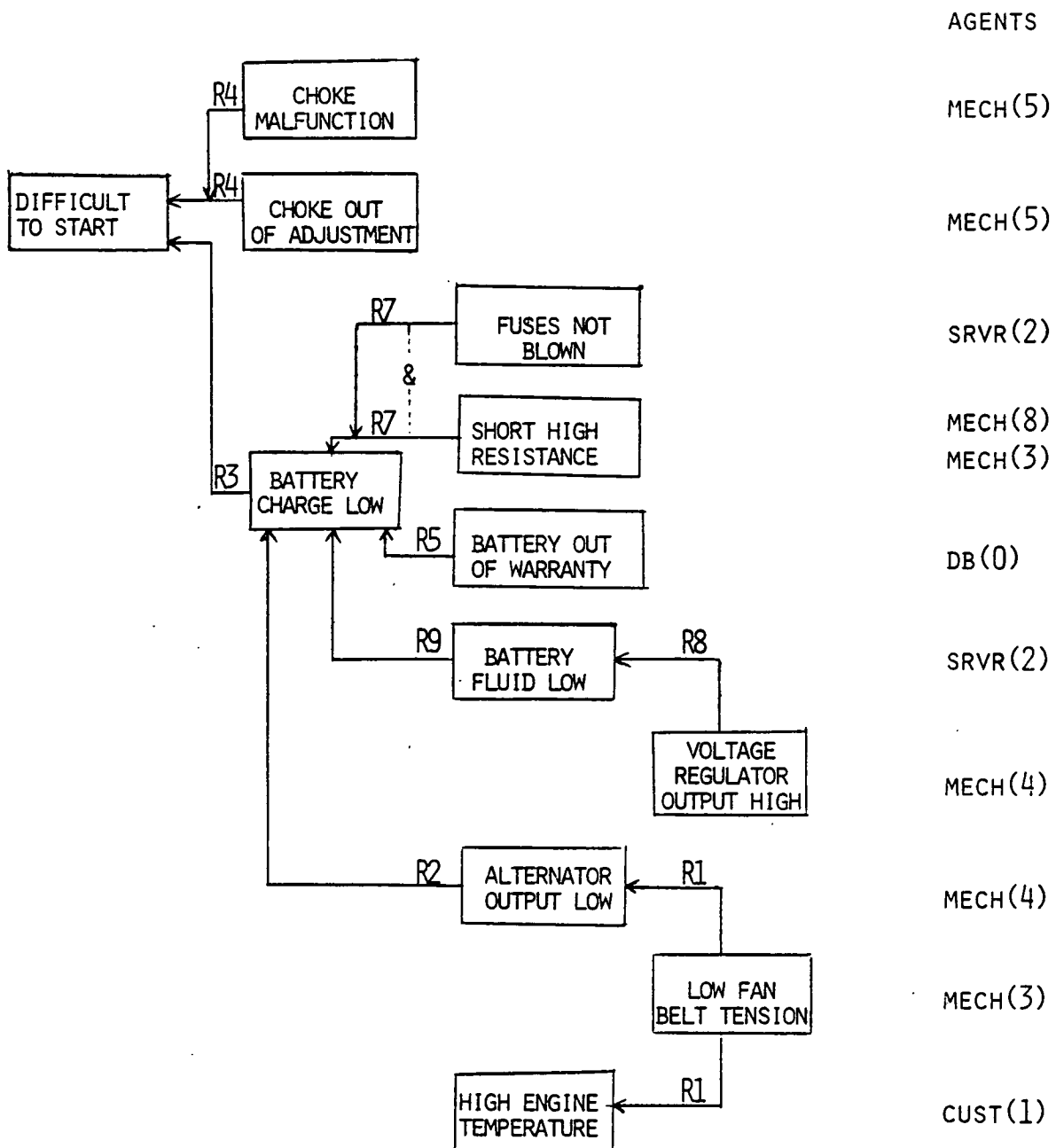


FIGURE 3.5 EXAMPLE FLOW IN AUTO DIAGNOSTIC SYSTEM

The structure shown in Figure 3-5 was grown by an algorithm called back chaining. A condition - in this case, "difficult to start" - is taken as a given, and the goal of the system is to find the cause(s). Note that the production rules state causes, then effects. Thus, the rules are used as if the knowledge possessed a kind of symmetry. The back-chaining algorithm is:

- (1) Find all rules that have the initial or derived condition as their consequence (in this case R3 and R4).
- (2) Call the antecedents (LHSs) of these rules' derived conditions.
- (3) Repeat steps (1) and (2), and terminate when no more can be done.

Figure 3-6 graphically shows the kind of structure grown for each kind of rule format. In each example in the figure, c1 is the initial or a derived condition.

Rule E1 is the simplest; a1 is added to the set of derived conditions. Rule E2 states that if a1 is the case, then both c1 and c2 ought to follow. Thus, a1 is a derived condition, and c2 may or may not be considered a derived condition, depending upon

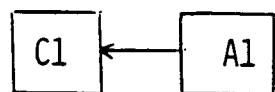
the particular strategy used by the system. Rule E3 is equivalent to two independent rules "IF a1 THEN C1" and "IF a1 THEN c2". Therefore, a1 is added to the set of derived conditions, and c2 part is ignored.

The example and discussion is some what simplistic, because there might be some problems which we did not consider. For example, suppose that rule R8 (in Figure 3-3) had been written more accurately as the two rules:

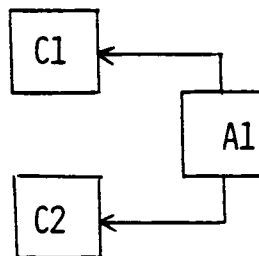
R8(1) IF voltage regulator output is high
THEN the battery will overcharge.

R8(2) IF battery is overcharged
THEN battery will boil off fluid.

E1 IF A1 THEN C1



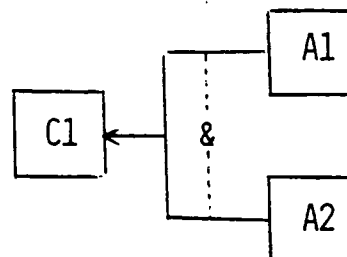
E2 IF A1 THEN C1 AND C2



E3 IF A1 THEN C1 OR C2



E4 IF A1 AND A2 THEN C1



E5 IF A1 OR A2 THEN C1

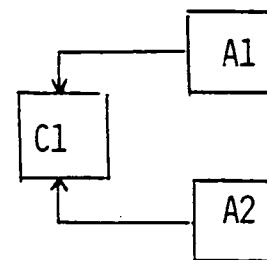


FIGURE 3.6 BACK CHAINING

With these new rules, a fragment of the structure shown in Figure 3-5 would be replaced by that shown in Figure 3-7. Now, the interesting conclusion is that a high battery charge implies a low battery charge. This is an apparent contradiction, since both conditions cannot hold at the same time. This kind of situation can often arise in unpredicted ways if the system contains many rules - more than a few dozen. The charge of the battery will oscillate between high and low as the battery fluid is replaced and boils off, respectively. So, in a sense, there is a missing rule of the form that adding fluid to a battery whose charge and fluid levels are low will probably allow the battery to return to normal conditions. However, to handle this kind of situation in general, it is necessary that the control mechanism or CE have some knowledge about how to proceed when faced with apparent conflicts and contradictions. One virtue of production systems is that ad hoc knowledge may be relatively easily incorporated in the system to handle this.

Additional relevant references include the following:
[Davis, et.al, 77; Shortliffe, 76; Shortliffe 75; Buchanan, 76; Feigenbaum, 71; Barnett, 75; Collins, 76; Forgy, 76].

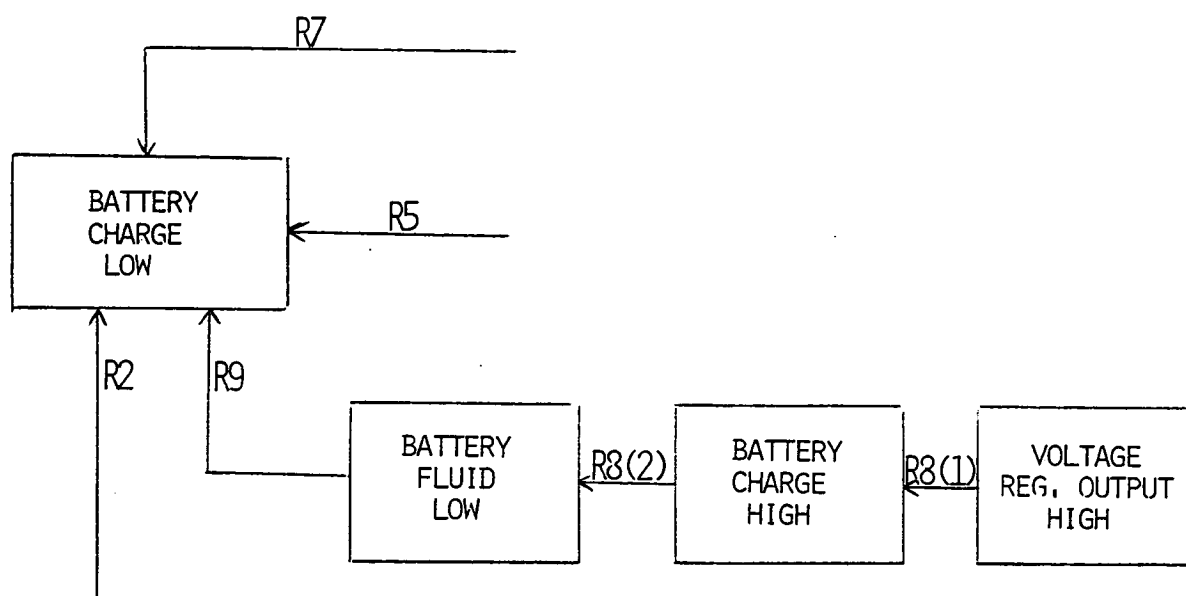


FIGURE 3.7 FRAGMENT OF GRAPH STRUCTURE

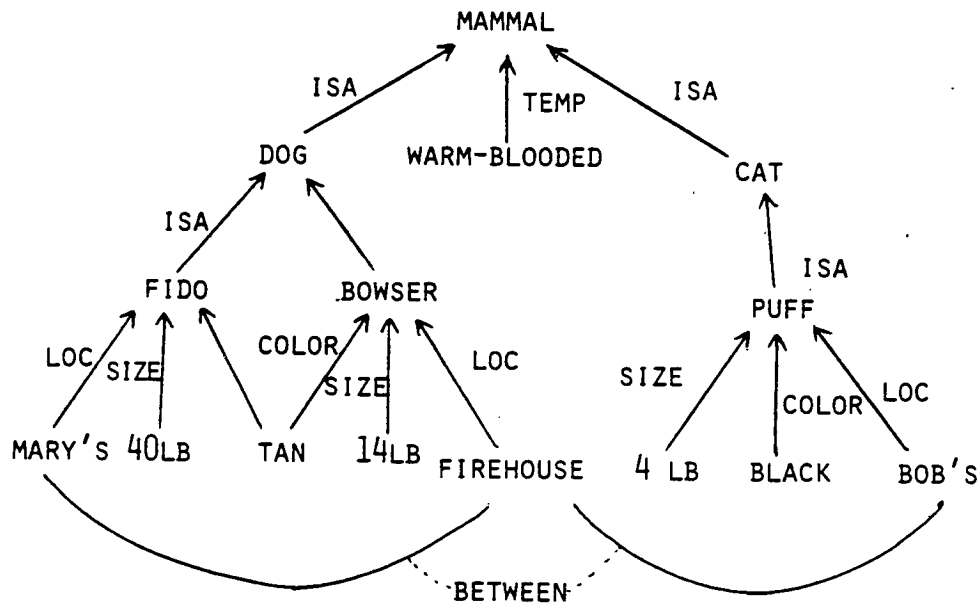
3.1.5 Semantic Networks [Nau, 83; Feigenbaum, 81]

A semantic network is a method of representing declarative knowledge about the relations among entities. The major application has been to include non-syntactic knowledge (e.g., semantics) in natural-language understanding systems. Because of their inherent generality and naturalness, semantic network have been used to represent highly interrelated information that cannot be properly processed by standard data base management techniques.

A semantic network is a KS. It is built up from knowledge chunks that are instances of a relation. The format of a chunk is: rel (a1 ... an), where rel is a relation name and the ordered tuple, (a1 ... an), is in the relation rel. For example, ISA (Dog, Mammal) means (Dog, Mammal) is a member of the relation ISA. ISA is conventionally taken to be the relation, more-specific-example-of. Thus, the above is the representation of the fact that a Dog is a specific kind of Mammal.

RELATIONS

TEMP(WARM-BLOODED MAMMAL)
 ISA(DOG,MAMMAL) ISA(CAT,MAMMAL)
 ISA(FIDO,DOG) ISA(BOWSER,DOG) ISA(PUFF,CAT)
 LOC(MARY'S,FIDO) LOC(FIREHOUSE,BOWSER) LOC(BOB'S,PUFF)
 COLOR(TAN,FIDO) COLOR(TAN,BOWSER) COLOR(BLACK,PUFF)
 SIZE(40LB,FIDO) SIZE(14LB,BOWSER) SIZE(4LB,PUFF)
 BETWEEN(MARY'S,FIREHOUSE,BOB'S)

SEMANTIC NETWORKRULES OF INFERENCE

$$\text{ISA}(X,Y) \wedge \text{ISA}(Y,Z) \Rightarrow \text{ISA}(X,Z)$$

$$\text{SIZE}(X,Y) \wedge \text{SIZE}(U,V) \wedge X < U \Rightarrow \text{SMALLER}(Y,V)$$

$$\text{ISA}(X,Y) \wedge R(U,Y) \Rightarrow R(U,X)$$
FIGURE 3.8 EXAMPLE SEMANTIC NETWORK

Figure 3-8 shows a semantic network (or net). The top of the figure lists the instances of relations using the relation names TEMP, LOC, COLOR, SIZE, ISA, and BETWEEN. TEMP(a,b) means a is the temperature of b; LOC(a,b) means a is located at b; COLOR(a,b) means that a is the color of b; and SIZE(a,b) means a is the size of b. The knowledge in a semantic net is given meaning by defining the relation names and other symbols used in the instances of relations, in terms of external entities.

The graph in the middle of Figure 3-8 shows exactly the same knowledge that is in the set of instances at the top of the figure. The entity names are connected by arrows labeled with appropriate relation names.

The external format of knowledge in a semantic network is usually very similar to the one used here. However, the internal storage of the semantic network closely corresponds to the graphical presentation - that is, a network structure built using pointers and list structures. The explicit connections among the entities enhances efficiency of programs that search through the semantic network.

The bottom of Figure 3-8 gives some examples of inference rules for the semantic network. It is possible to represent the inference rules as a production system. This has the advantage

of allowing procedural knowledge to be used to test for complex conditions.

The first rule says that (for all x, y, and z) if x is a y and y is a z, then x is also a z. An example of this is: Fido is a Dog and a Dog is a Mammal; therefore, Fido is a Mammal. The second rule says that if y and v are two entities that have SIZE, and the size of y is less than the size of v, then y is SMALLER than v. Thus the instance of the relation, SMALLER(Puff, Bowser).

This inference rule defines instances of relations whose names do not appear explicitly in the semantic network. The last example inference rule says that, if x is a y, and y has a property conferred by the binary relation, r, then x has the same property conferred by r, i.e., properties are inherited. Thus, Fido is a Mammal (by the transitivity of ISA - first rule), and a Mammal has the property, WARM-BLOODED (conferred by the relation TEMP), therefore, Fido is WARM-BLOODED.

However, the indiscriminate use of the third rule can cause derivation of incorrect results. For example,

ISA(Dog, Mammal) AND ISA(Cat, Mammal) ==> ISA(Dog, Cat)

In order to avoid this kind of problem, it is necessary to have some knowledge (non-syntactic) about the relations to which inference rules are applied. One possible solution is to have a rule, such as the third example rule, for each relation that is inheritable. Another solution is to embed the inference rules in the CE along with the necessary ad hoc knowledge to avoid the problems. If the number of relations occurring in the semantic network is large or if the relation set can be modified or expanded - then both these approaches cause problems.

A more general approach to the problem treats relation names and entity names more uniformly. For example, temperature is defined as an inheritable property by an instance like INHERITABLE(TEMP).

The third inference rule is then rewritten as:

$$\text{ISA}(x,y) \text{ AND } r(u,y) \text{ AND INHERITABLE}(r) \implies r(u,x)$$

With this approach, relations can be arguments to relations, and hence have the same properties as other entities.

Another choice and tradeoff about a semantic network is the decision about which relations and which instances in the relations ought to be stored explicitly and which should be

computed via the inference rules. Explicit storage costs space, and inference rules cost computation time.

A technique often used with semantic networks is to make a distinction between general knowledge and specific knowledge and to store the two in a different manner. Specific knowledge has the general characteristic of being "low" in the tree - as shown in the middle of the figure. This means:

- (1) There are few if any chains below it.
- (2) Therefore, properties have simple values.
- (3) Most entities, in the same general classification have all and only a known set of properties.
- (4) There are a large number of entities in a general class. For our example, the specific knowledge can be displayed tabularly as:

ENTITY	ISA	SIZE	COLOR	LOC
Fido	Dog	4011b	Tan	Mary's
Bowser	Dog	1411b	Tan	Firehouse
Puff	Cat	411b	Black	Bob's

The above conditions make it likely that the specific knowledge can be gathered into a tabular form by simple

mechanical means, and that the specific knowledge (which is usually most of the semantic net) can be kept in relatively inexpensive secondary storage and even accessed through an efficient, existing data management system. The general knowledge is kept in primary memory. Fortunately, most processing by the inference rules occurs on other than the "bottom" of the network, so that efficiency is maintained.

Semantic networks are by far the best available technology for representing definitional and relational knowledge that is too complex for ordinary data management techniques. This is the case because the structure allows for the inclusion of ad hoc information, and the utilization of inference rules permits straightforward enhancement of the inherent representational power and completeness.

On the other hand, there are some disadvantages to the use of semantic networks to represent knowledge in a KBS. The principal one is that the chunk size is fairly small. The result of this is that reasoning chains can be quite lengthy and tedious. Another result is that processing a semantic net can consume large amount of computer time.

Additional references include the following: [Duda, et.al, 77; Grignetti, 75; Mylopoulos, et.al, 75; Norman, 75; Woods, 75;

Schubert, 76].

3.1.6 Frames

A research topic of great current interest in computer representation of knowledge is frame theory. No one has succeeded in defining frames to all researchers' satisfaction. Some of the common features in proposals about frames are:

- (1) A frame is a knowledge chunk.
- (2) A frame has a collection of definitional and procedural knowledge about an object, action, or concept.
- (3) A frame is a complex data structure that has named slots corresponding to definitional characteristics.
- (4) A frame has the ability to attach procedural knowledge to the slots and/or to the frame itself.

An example (Figure 3-9) to illustrate some of the above features is discussed below.

The top of the figure presents definitional information about a dog. The first line states that a dog is a "mammal". The next line means that there is a slot, named "kind" (of dog), that may be filled with a value of (type) "breed". ("Breed" in this example is itself a frame). The color of a dog is limited to one or a mixture of the stated colors by the SUBSET.OF

operator. Default values are indicated by underlining, and the FROM operator is used to pick out values from other frames. Thus, the combined effect of the phrase FROM color OF kind is to make the default value for the color of a dog the default for his breed. The state of a dog is either "adult", the default, or "puppy" if the age is known to be less than one year.

The bottom of the figure shows a frame for "boxer" and declares that boxer is a breed - but only a breed of dog. The color of a boxer is restricted to one of the colors "tan", "brown", and "brindle", with a default of "tan". If this breed did not have a characteristic color restriction, then this slot would be omitted. The next slot says that the size of a boxer is between 40 and 60 pounds. No default is specified. The tail and ears slots are defined with default value "bobbed" and the respective alternatives of "long" and "floppy".

```

dog      FRAME   ISA   mammal
        kind     breed
        color    SUBSET.OF {tan brown black white rust}

        FROM color OF kind

        leggedness 0...4
        weight      >0, FROM size OF kind
        state       adult OR puppy if age < 1
        age         >0, now birthday
        birthday    date
        name        string

        END                dog

boxer    FRAME   ISA   breed OF dog
        color      ONE.OF {tan brown brindle}
        size        40...60
        tail        bobbed OR long
        ears        bobbed OR floppy
        temperment  playful
        COMPLAINTS  IF weight > 100 THEN ASSUME
                                (great dane)

        END                boxer
  
```

Figure 3-9 EXAMPLE FRAME DEFINITIONS

Temperment is shown to always be playful. The last line shows an example of a complaint and ad hoc knowledge used to make a recommendation, namely, if you see a giant boxer, then assume that it might be a Great Dane instead.

Figure 3-10 shows an example use of frames in a recognition task. The top of the figure shows some feature values (e.g., color is tan, ears are bobbed) that have been detected for an object, here identified as number 456. The CE has matched the known feature values with the available frames and has manufactured the working hypothesis shown at the bottom of the figure - namely, a boxer dog that is assumed to have bobbed tail and to be an adult. It is noted that this particular boxer (object number 456) is mean and that this is exceptional. Also, the size of the boxer was only approximately known, but the approximation has been used in lieu of a more accurate value.

LOW-LEVEL INFORMATION

OBJECT 456

color = tan
 ears = bobbed
 leggedness = 4
 size = 40 - 45
 temperment = mean

TRIAL IDENTIFICATION

[OBJECT 456 ISA dog

kind	boxer	WITH [color	tan
		size	40 - 45
		tail	ASSUMED bobbed
		ears	bobbed
		temperment	EXCEPTIONAL
			mean]
color	tan		
leggedness	4		
weight	40 - 45		
state	ASSUMED adult]		

Figure 3-10 INEXACT MATCH BY A FRAME SYSTEM

A possible scenario for the recognition task: A general matching procedure would attempt to instantiate all frames in the system until a reasonable fit was found; in the example, "boxer" is a reasonable match. Slots that are yet unfilled would be used to hypothesize other values not yet detected. For the boxer frame, a bobbed tail would be predicted and put on an agenda of things to look for. Assuming there was a frame for tails, it might possibly contain heuristic knowledge about how to more carefully scan the raw data to confirm or deny the existence of a particular kind of tail. Other activity that could emanate from the boxer frame is the activation of a complaint. Thus, if the weight of the boxer was too large, the complaint mechanism could change the identification of the instantiation of the boxer frame into one for a Great Dane.

Besides the prediction and correction activity resulting from the partial match to a frame, a third process can be tried. Namely if the match is good enough, then the frame can become more informative. For our example, the transformation is from a boxer to a boxer dog where more information is absorbed, e.g., leggedness.

The belief is that this style of recognition will be more goal directed - and hence more accurate and efficient -

than general techniques that depend upon regularity and uniformity of structure.

Additional relevant references include the following:
[Nilsson, 80; Winston, 77; Bobrow, 77; Winograd, 75; Malhotra, 75; Davis, 76].

3.2 Workspace Representation

The workspace is the encapsulation of the system's current state in a problem solving activity. It includes:

- (1) Global variables - computed values, goals, and input problem parameters.
- (2) An agenda - a list of activities that can be done next.
- (3) A history - what has been done (and why) to bring the system to its current state.

The simplest example of a workspace representation is the push-down stack in a LISP-like system. The stack contains the bindings of global variables, return address (a history snapshot), and the values of temporaries. There is no agenda in a simple system other than the program counter. A more

complicated example is the data base in a production system. It contains the entire state of the system, including an implicit agenda (the conflict set of rules that can apply).

In most computer programs, the workspace can be represented in an ad hoc way using whatever techniques are provided by the containing program-language system. However, this is not always adequate in KB system because:

- (1) The capability to provide explanations is based in part on an ability to find the trace of events (history) that produced the solution.
- (2) Efficient reasoning behavior depends on the selection of the next thing to be done - hence, the necessity for an explicit agenda and visibility of enough state (global variables) to make informed decisions. Further, if a KBS has many knowledge sources, the workspace representation may be used to provide a communication channel among them.

3.3 Cognitive Engine

In a KBS, the primary function of the cognitive engine (CE) is to perform the task of problem solving. A secondary function

of the CE is to explain the behavior of the system and support its derived solutions. To accomplish these functions, the CE must:

- (1) Control and coordinate system activities and resources.
- (2) Plausibly reason about domain-specific problems by having access to and using the contents of the KB, the contents of the workspace, and knowledge and procedures embedded in the CE.
- (3) Link the KB with the interface module(s).

The CE is the most active component of a KBS. That is, it is always instantiated, and it controls the activation and utilization of other system modules. Another characterization of a CE is that it is the intelligence or understanding component of a KBS (even though its activity may, to a degree, be guided by higher-level (control and/or meta) knowledge in a KS).

The following three definitions are from [Feigenbaum, 81].

A CE is sound if it produces only correct or "I don't know" solutions, i.e., it does not produce incorrect solutions.

A CE is complete if it can always produce a solution to a posed problem when a solution exists.

A CE is admissible if it always finds a minimal-cost solution when a solution exists. The cost is taken to mean the cost of using the solution, not necessarily the cost of finding it.

3.3.1 CE Strategies

The input to a CE is usually a set of initial conditions and a goal. The KB is used in some manner to find a method of obtaining the goal given the constraints imposed by the initial conditions. There are four ways of doing this:

- (1) Forward chaining - apply the KB to the givens to infer new conditions; continue in this manner until the goal is satisfied.
- (2) Back chaining - apply the KB to the goal to produce new subgoals; continue in this manner until the initial constraints or primitive conditions (known to be solvable) are reached.
- (3) Chain both ways - forward chain from the initial conditions and backward chain from the goal until a

common middle term is produced.

- (4) Middle term chaining - using the KB, guess a middle term and solve separately the problem of getting from the initial conditions to the middle term and from the middle term to the original goal; continue in this manner until a solution in terms of primitives is generated. (This method is also called problem reduction.)

Figure 3-11 shows an example of the first three of these techniques. The KB contains three rules:

- (1) Any integer, x , can be replaced by $2x$ ($x \rightarrow 2x$).
- (2) Any even integer, $2x$, can be replaced by x ($2x \rightarrow x$).
- (3) Any integer, x can be replaced by $3x+1$ ($x \rightarrow 3x + 1$).

The problem is to transfer 4 into 20 using the permitted operations. The top figure shows forward chaining - i.e., start with 4 and apply the operations until 20 is produced. The middle figure shows back chaining - i.e., start with the goal, 20, and use the inverse of the above rules and continue until 4 is produced. The bottom figure shows the chain-both-ways technique.

First, one step of back chaining produces the nodes labeled 10 and 40. Then one step of forward chaining produces the nodes labeled 8,2, and 13. Finally, one more step of back chaining is done to produce the nodes labeled 5,3,13, and 80. Since 13 is on both the forward and backward grown "wave fronts", the process can terminate; otherwise, the steps of forward and backward chaining would continue to alternate until either a solution was found or the system gave up.

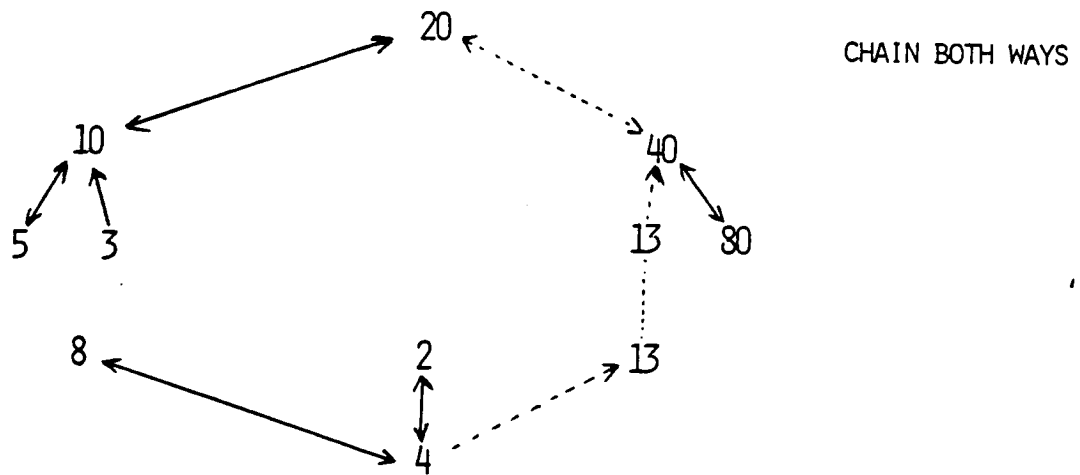
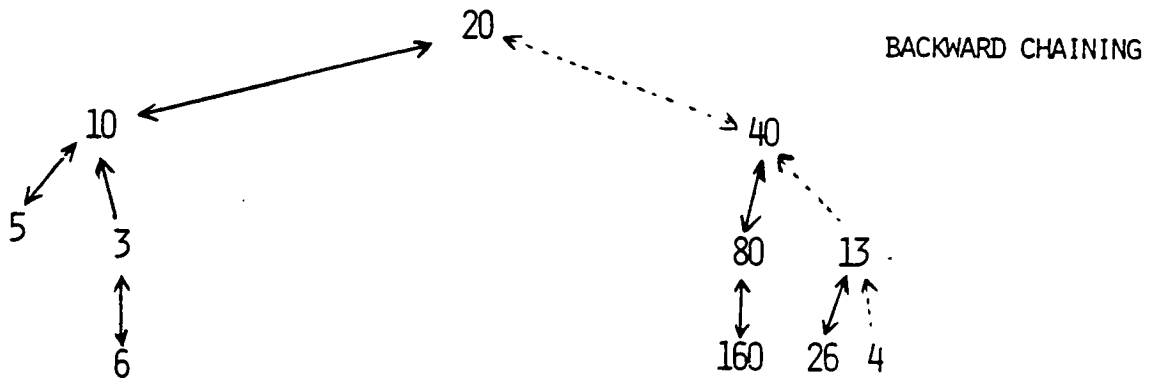
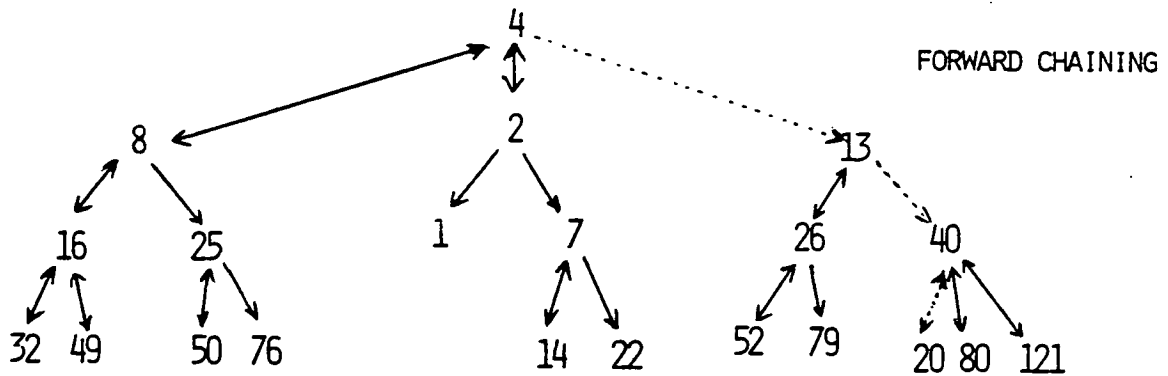


FIGURE 3.11 CHAINING EXAMPLES

Another way of differentiating CE strategies is via breadth-first vs. depth-first. In a breadth-first system, all possible methods of continuing are attempted in parallel. This is showed in Figure 3-11, where each (horizontal) level of the graph was generated by a single cycle of the system. In a depth-first system, some path (node, state, etc.) is selected and a single continuation is attempted, i.e., the node is not fully expanded all at once. This path continues growing until either the path reaches a solution or some path-length constraint is violated. In the latter case, the path is backed up to the deepest node at which an alternative expansion exists. At that point, another path continuation is generated. This process continues until either a solution is produced or the alternatives that could produce a solution within the length constraint are exhausted. A depth-first strategy can be more efficient than a breadth-first one if a good technique exists for ordering production of path extensions. Figure 3-12 shows an example of a depth-first strategy combined with back-chaining for the prior problem. A maximum path length 4 was used as a constraint, and the order of (inverse) operator application was:

(1) $n \rightarrow 2n$.

(2) $2n \rightarrow n$.

(3) $n \rightarrow 3n + 1$.

Each node has a superscript that denotes the order in which the nodes were generated.

Additional references include the following: [Nilsson, 80; Klahr, 78; Miller, 73].

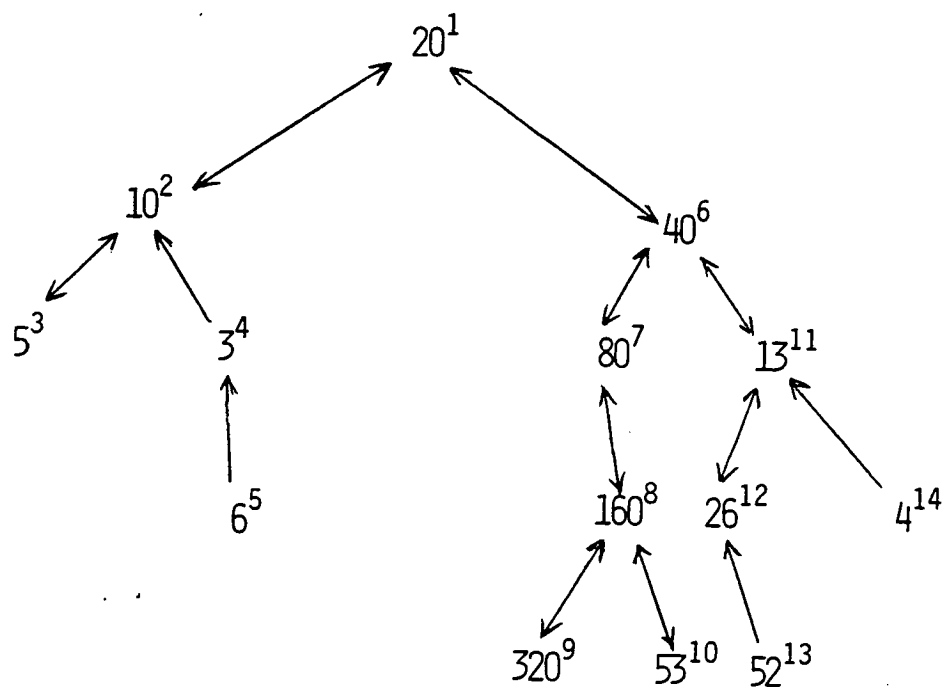


FIGURE 3.12 DEPTH-FIRST BACK CHAINING

3.3.2 Methods of Implementing the CE

Most methods and techniques used to implement a CE are intimately connected to the choice of a representation technique for the KB. However, there are a few methods that are general enough to be used with a variety of KB representations. Two classes of them are: search methods and modeling/simulation methods [Feigenbaum, 81]. The third widely used technique is pattern-matching [Kanal, 68].

These techniques will be addressed in a future report.

3.4 The Interface

The interface component of a KBS provides the necessary connections and communications with the environment and user. It is not always engineered as a separate module in the system; usually it is integrated into the CE and accesses the KB [Davis, 76].

The interface has three logical parts: the user interface, the expert interface, and the external data interface.

3.4.1 The User Interface

The user interface is the most important component of a KBS in determining its acceptability to the practitioners of the intended domain. In general, they are neither computer scientists nor programmers, and may view the computer, especially a KBS, as a feared and unworthy competitor. A properly functioning user interface will smooth out and minimize the problems associated with learning any new system, and in the long run improve system productivity by making it possible for the users to be more cooperative in problem-solving activities.

In order to qualify as a KBS, the user interface must, at a minimum, be interactive and use domain-specific jargon. The reason for requiring the system to be interactive is simply that the state of the art does not provide techniques for going from problem statement to "best" answer without additional information that must be solicited from the user. The problem with providing initially, along with the problem statement, all information that might conceivably be needed, is that most of it is unnecessary. Another reason for wanting a KBS to be interactive is so that explanations of system behavior and results can be solicited.

Besides using domain-specific jargon, many KB systems accept and output information using an English-like natural language.

Much of the ambiguity of natural language can be eliminated when the dialog is restricted to a particular domain and it is known that the user is engaged in goal-oriented problem-solving activity.

Another desirable characteristic of the user interface is soft failure. That is a KBS should not blow up because the user makes a mistake, nor should it conceal its problem. A useful technique to smooth over some problems of this sort is a spelling corrector.

One of the problems confronting the explanation mechanism in the user interface is translating explanations into a natural form for the user. Fortunately, the complexity of this task is substantially reduced by uniformities of format in the KB and in the workspace. For example, in a production system, it is straightforward to turn an IF-THEN rule out in reasonable English. The usual approach is to have a separate scheme for each kind of knowledge chunk in the KB and element in the workspace; most such schemes look like sophisticated fill-in-the-blank formulae.

3.4.2 The Expert Interface and Knowledge Acquisition

The expert interface is the mechanism through which

knowledge is added to the KB or the KB is modified. Its intended users are experts in the problem domain and the system implementors who are responsible for building the initial KB. This interface is often called a knowledge acquisition interface [Barnett, 75]. Unlike the user interface, it can be assumed that the user of the expert interface has some knowledge and awareness of the structure and functioning of the KBS. Table 3-1 summarizes the knowledge-acquisition process.

The knowledge that goes into a KBS must originate from some external source. The most usual is an expert in the problem domain. He can provide specific facts, rules of thumb, and the rules of reasoning, along with his rating of confidence. Other originating sources of knowledge commonly used are journal articles, texts and engineering handbooks. The information from these sources often is hard data and tabular. Therefore, it usually comprises fact files in the KB.

ORIGINATING SOURCE

Domain Expert (or User)
 Journals
 Texts
 Protocol Studies
 Derived Results

ENTERED BY

Domain Expert
 Implementor
 User
 CE

COMPILED BY

Knowledge Acquisition Interface
 Implementor

ISSUES

Interface Language
 Consistency
 Accommodation
 Confidence Factors

MAJOR OUTSTANDING PROBLEMS

Knowledge Acquisition
 Learning
 Extensibility

TABLE 3-1 KNOWLEDGE ACQUISITION
 (Based on [Hayes-Roth, 83])

Ideally, the knowledge-acquisition interface can be used by domain experts and users of the system other than the implementation staff. However, in many KB systems, the complexities of adding to or modifying the KB are such that programming skills are required. For such systems, a computer specialist may need to act as an intermediary between the originating source and the KBS.

The knowledge-acquisition interface has three major tasks:

- (1) Accepting knowledge in external format and translating it into internal format.
- (2) Validating consistency of new and old knowledge.
- (3) Storing knowledge into the KB. This is called Compilation.

4. APPLICATION CONSIDERATIONS [Buchanan, 75; Nilsson, 80]

Though there exists a relatively diverse collection of existing and developing KBS applications, the selection process for each new application requires consideration of a variety of issues. First, there is a set of initial considerations that address the issues of the problem domain itself and the people

associated with it, the experts and the practitioners. Next, are the technology considerations that focus on the availability of usable technology for implementing a KBS that has successfully met the first criterion. Last, there are the equally important considerations that are directed at determining whether or not the development environment and the user environment are properly supportive.

Each of these groups is considered below in the form of a set of questions [Buchanan, 75].

4.1 Initial Considerations

- (1) Does the problem have a closed-form solution?
- (2) Is there an expert who knows how to solve problem?
- (3) Is there an expert available and can he work on the development of a KBS?
- (4) Does the expert have a model to solve the problem?
- (5) Is the domain well bounded?
- (6) Are the intended users professionals?
- (7) Are the economics right?

4.2 Technology Considerations

- (1) Can a first-order model (simulation) be constructed with the help of expert(s)?
- (2) Is there a knowledge representation that matches the "chunk size" of the expert's knowledge?
- (3) What are the necessary knowledge source(s) and their representation(s)?
- (4) What reasoning or inference methods are needed?
- (5) Are the knowledge representation and reasoning method compatible with one another?
- (6) Will the system support growth?

4.3 Environmental Considerations

- (1) Is there an interactive system for the KBS users?
- (2) Do the necessary tools exist, in particular a properly expressive programming system?
- (3) Will the resultant system perform effecently?

5. CONCLUSIONS

The technology of knowledge-based systems has emerged from the laboratory, but it has not achieved the status of being a commonly known way of implementing computer-based application systems. Systems have been developed in an intriguing spectrum of application areas, from medicine and chemistry to geology and business. The general level of accomplishment appears to be high enough to make it worthwhile to begin exploring other areas for immediate potential application.

There remain a number of unresolved issues. Even with a group of domain experts who are cooperative and well motivated, the methodology for transferring their knowledge to the system is, at best, ad hoc. This is the area in which more research is needed to discover (or convert) what amounts to a completely new technology: the acquisition, communication, and representation of expertise (the ability to use a body of knowledge effectively in solving a particular problem).

APPENDIX A. A KBS CASE STUDY (MYCIN)

MYCIN is a medical consultation system. The material covered here is a condensation of [Shortliffe 76; Shortliffe 75; Davis, 77; Davis, 76].

The Problem Domain And The Users

MYCIN is a knowledge-based interactive computer system intended to provide advice to physicians on prescribing antimicrobial therapy for bacterial infections of the blood (bacteremia). The problem of therapy selection and recommendation for an infectious disease is difficult and complex. The first is to determine whether or not the infection is serious enough to warrant treatment. If it is determined that treatment is warranted, one should know what organism is causing the infectious disease. To do this, one must obtain a specimen of the infection for culturing, analysis, and identification by a laboratory. This is a time consuming process. And in many cases, the infection is serious enough that treatment must be begun before all of the analysis can be completed. Therefore, any recommended therapy must be based on incomplete information. To further complicate matters, the most effective drug against

the suspected or identified organism may be totally inappropriate for the specific patient because of age or medical conditions and problems. Thus, any system or consulting physician must be aware of all of these complexities if proper advice is to be rendered in each specific case. MYCIN has been designed to cope with just such complexities and interrelationships among the many variables and to provide a physician with advice that is proper for each individual patient.

Though the problem is quite complex, the domain is well bounded. MYCIN requires knowledge related only to infectious diseases, and knowledge related to experience with various infectious organisms in terms of resistance to specific drugs, and knowledge of symptoms related to specific infections.

MYCIN is intended to be used by physicians. The dialogue that it carries on with the user is in the jargon of medicine and specifically that of infectious diseases, laboratory procedures, infectious organisms, drugs, etc. Thus, a user is expected to be a competent medical practitioner.

MYCIN'S Knowledge Base

MYCIN's knowledge base (KB) contains several knowledge sources - production rules, clinical parameters, special functions, and procedures for therapy selection.

Each production rule consists of a Premise, which may be a condition or a conjunction of conditions, an Action to be taken, and sometimes an Else clause. For the action to be taken, each of the conditions in the Premise must hold. If the truth of the Premise cannot be ascertained or the Premise is false, the action in the Else clause is taken if one exists; otherwise, the rule is ignored. In addition, the strength of each rule's inference is specified by certainty factor (CF) in the range -1 to +1. CF's will be discussed in the next section. Each rule in MYCIN falls into one and only one of the following categories:

- (1) Rules that may be applied to any culture.
- (2) Rules that may only be applied to current cultures.
- (3) Rules that may be applied to current organisms.
- (4) Rules that may be applied to any antimicrobial agent administered to combat a specific organism.
- (5) Rules that may be applied to operative procedures.
- (6) Rules that are used to order the list of possible therapeutic recommendations.
- (7) Rules that may be applied to any organism.

- (8) Rules that may be applied to the patient.
- (9) Rules that may be applied to drugs given to combat prior organisms.
- (10) Rules that may be applied only to prior cultures.
- (11) Rules that may be applied only to organisms isolated in prior cultures.
- (12) Rules that store information regarding drugs of choice.

The system also contains a collection of clinical parameters, represented as <attribute, object, value> triples. These clinical parameters fall into six categories:

- (1) Attributes of cultures.
- (2) Attributes of administered drugs.
- (3) Attributes of operative procedures.
- (4) Attributes of organisms.
- (5) Attributes of the patient.
- (6) Attributes of therapies being considered for

recommendation.

Each of the parameters has a certainty factor reflecting the system's "belief" that the value is correct and an associated set of properties that is used during consideration of the parameter for a given context. These properties specify such things as the range of expected values a property may have, the sentence to transmit to the user when requesting data from him, the list of rules whose Premise references the parameter, the list of rules whose Action or Else clause permits a conclusion to be made regarding the parameter, etc. Only those properties that are relevant to each parameter are associated with it. However, properly specifying how the parameter is to be represented in English is mandatory for all.

Additional information is contained in simple lists that simplify references to variables and optimize knowledge storage by avoiding unnecessary duplication. These lists contain such things as the names of organisms known to the system and the names of normally sterile and non-sterile sites from which organisms are isolated.

In conjunction with a set of four special functions, MYCIN uses knowledge tables to permit a single rule to accomplish a task that would otherwise require several rules. The knowledge

tables contain a record of certain clinical parameters and the values they may take on under various circumstances.

There is one knowledge source in MYCIN that is as a set of functions. This is the knowledge required for choosing the apparent first-choice drug to be recommended.

This constitutes the majority of MYCIN's knowledge base, which permits the system to comprehend the nature of an infection without complete information about the organism involved and provide the physician with proper advice regarding treatment under the circumstances. This organization and structure, along with the way the knowledge is used facilitates the system's ability to explain its actions and advice.

MYCIN's Cognitive Engine

MYCIN's cognitive engine is domain independent in the sense that none of the knowledge required to provide advice about bacteremia is embedded in it. Thus, additional rules concerning infectious disease may readily be added, or a new knowledge base could be substituted to provide therapeutic advice about a different domain of infections.

The task that MYCIN performs, under the control of its CE, can be characterized as a four-step decision process:

- (1) Decide which organisms, if any, are causing significant disease.
- (2) Determine the likely identity of the significant organisms.
- (3) Decide which drugs are potentially useful.
- (4) Select the best drug or drugs.

A consultation session between a physician and MYCIN results from a simple two step procedure:

- (1) Create the patient "context" as the top node in the context tree.
- (2) Attempt to apply the "goal-rule" to the newly created context.

The "goal-rule" is one of the rules from the category of those that may be applied to the patient (as described above), and states: "If there is an organism that requires therapy and consideration has been given to the possible existence of additional organisms requiring therapy, even though they have not been recovered from any current cultures, then do the following: Compile a list of possible therapies which, based upon

sensitivity data, may be effective against the organisms requiring treatment and determine the best therapy recommended from the compiled list; otherwise, indicate that the patient does not require therapy."

This rule follows the four-stage decision process given above.

The two components, or programs that constitute MYCIN's CE are called MONITOR and FINDOUT. MONITOR's function is to determine whether the conditions stated in the Premise of a rule are true. To do so, it considers each condition of the Premise at hand, first determining whether it has all of the necessary information to make the determination. If it requires information, it calls FINDOUT to obtain what is needed. FINDOUT first determines whether the needed information is laboratory data. If it is, it asks the physician for it. If the physician cannot provide it, FINDOUT retrieves the list of rules that may aid in deducing the information and calls MONITOR to evaluate the rules. When the process completes, control is returned to MONITOR. If the information needed is not laboratory data, FINDOUT retrieves the list of rules that may aid in deducing the needed information and calls MONITOR to evaluate the rules. If the deductive process of applying the rules (backward from a goal to the data or information needed) cannot provide the needed

information, the physician is asked to provide it. In either case, control is returned to MONITOR. Given the information that is provided by FINDOUT or that was already available, MONITOR determines whether the entire Premise is true. If it is not, and there is no Else clause, the rule is rejected. If the Premise is true or the Else clause is invoked, the conclusion stated in the Action of the rule or in the Else clause is added to the ongoing record of the consultation, and the process completes. Note that there is a recursive relationship between MONITOR and FINDOUT, such that so long as any information is needed to evaluate a Premise, or rules are required to develop the needed information, the two components are in a recursively dependent and oscillating relationship until the very first rule invoked, the "goal-rule", is satisfied. In the process of evaluating the rules, a great deal of related and necessary information and data are developed and retained in various tables and structures in the workspace. They serve two purposes:

- (1) They prevent wasted effort that would be required to redevelop information that has already been obtained, and to prevent the system from endlessly chasing its tail.
- (2) They provide the necessary history required for the

explanations that may be requested by the user.

In addition to having certainty factors (CFs) for the rules and the clinical parameters in the knowledge base, the physician, when asked for either laboratory data or other information that the system itself cannot deduce, may attach a CF to his input. The default, if the physician does not provide a CF, is assumed to be +1. The certainty factors are the key to permitting MYCIN to perform inexact reasoning. The rationale, mathematics, and application are thoroughly treated in [Shortliffe, 76]. The presentation here is very simplified.

A certainty factor (CF) is a number between -1 and +1 that reflects the degree of belief in a hypothesis. Positive CFs indicate that there is evidence that the hypothesis is valid; the larger the CF, the greater the degree of belief. A CF = 1 indicates that the hypothesis is known to be correct. A negative CF indicates that the hypothesis is invalid; CF = -1 means that the hypothesis has been effectively disproven. A CF = 0 means either that there is no evidence regarding the hypothesis or that the evidence is equally balanced. The hypotheses in the system are statements regarding values of clinical parameters for the nodes in the context tree. To properly perform, MYCIN must deal with competing hypotheses regarding the value of its clinical

parameters. To do so, it stores the list of competing values and their CFs for each node in the context tree. Positive and negative CFs are accumulated separately as measures of belief (MB) and measures of disbelief (MD) and added to form a resultant CF for a clinical parameter. The CF of a conclusion is the product of the CF of the rule that generated the conclusion and the tally of the CFs of the clinical parameters that were used in substantiating the conclusion. When a second rule supports the same conclusion, the CFs are combined by $z = x + y(1-x)$, where x is the CF of the first supporting rule, y is the CF of the succeeding rule and z is the resultant CF for the conclusion. The CFs permit the system to report findings to the physician with varying degrees of certainty such as, "There is strongly suggestive evidence that", "There is suggestive evidence that", "There is weakly suggestive evidence that", etc.

Context Tree. The topmost tree is always the patient. Branches are added successively to the existing nodes as FINDOUT discovers a need for them in attempting to obtain requested information for MONITOR. Thus, given only the patient, when MONITOR requests information from FINDOUT about organisms in order to evaluate the first condition in the Premise of the goal-rule, FINDOUT discovers that it cannot get organism information without having information about cultures. Thus,

context(s) concerning cultures(s) are spawned from the patient node, from which eventually are spawned contexts for the organisms identified by the cultures. For those organisms deemed significant, links attach to context nodes about the relevant drugs for treating these organisms. Thus, the context tree is tailored for each patient as the system progresses through its reasoning process.

MYCIN's Explanations

One of the primary design consideration taken in MYCIN was the requirement that the system be able to explain its decisions if physicians were going to accept it. Selecting rules as the representation of the system's knowledge greatly facilitated the implementation of this capability. The physician using the system enters the explanation subsystem automatically when the consultation phase is completed, or he may enter it upon demand during the consultation session at any point at which the system requests input from him. In the latter case, he can input "WHY" to request a detailed answer about the question just asked of him or he can input "QA" to enter the general question-answering explanation subsystem to explore the decisions and other aspects of the consultaion up to the point of divergence.

The explanation provides several options to the physician.

Since the system automatically enters this mode at the end of the consultation, the physician may simply input "STOP", which terminates the system. He may input "HELP", which provides him with the list of explanation options, which include:

Input	Option
EQ	Explain a specific question asked of the physician during the consultation - each has a sequence number, which must accompany the EQ request.
PR	Requests a particular rule be printed and must be followed by the rule number.
IQ	Is a prefix for a question about information acquired by the system during the consultation. The question is phrased in the limited English that MYCIN can handle.
no prefix	A general question is assumed being asked about the content of MYCIN's rules.

Thus, the physician can ask to have Question 48 explained by inputting "EQ48". To which the system would respond: QUESTION 48 WAS ASKED IN ORDER TO FIND OUT THE PATIENT'S DEGREE OF SICKNESS (ON A SCALE OF 4) IN AN EFFORT TO EXECUTE RULE068. He may then optionally input "PR68" or "WHAT IS RULE068" to see what exactly was being sought and why.

MYCIN's Interfaces

MYCIN has two interfaces. One is for the using physician,

through which he may answer questions posed by the system and ask questions of it; the other is a knowledge-acquisition interface accessible only to experts recognized as such by the system.

All of the questions asked of the user have been carefully designed not to require the language-understanding component. Thus, instead of asking, "What is the infectious disease diagnosis for the patient?" it asks, "Is there evidence that the patient has a meningitis?" To which only a simple "yes" or "no" is required.

The knowledge-acquisition interface, on the other hand, permits the expert to input a new rule in stylized English, with prompting to obtain the rule in the proper sequence: Premise first, condition by condition, followed by the Action, and then an Else clause if one is required. The system then translates the rule into internal form, reordering the conditions of the Premise if necessary, according to a set of criteria developed to improve the rule-evaluation process. It then retranslates the rule into English and requests that the expert decide whether the rewritten version was the one intended. If not, the expert may modify selected parts and is not required to restate the entire rule unless there has been a gross misunderstanding.

The same mechanism is used when an expert wants to correct

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or modify an existing rule. In all cases, when a new or corrected rule has been approved by the expert, the system checks to see whether the rule is consistent with the existing rule set. If the new or modified rule subsumes or is subsumed by an existing rule, it is not readily discoverable, and no test is made for this condition. If a rule is discovered to be in conflict with an existing rule, it is rejected.

REFERENCES

- [Bobrow, 77]. D. Bobrow, T. Winograd, "An Overview of KRL, a Knowledge Representation Language", Cognitive Science, vol. 1, no. 1, 1977.
- [Barnett, 75]. J. Barnett, "A Phonological Rules System", Technical Memo, TM-5478/000/00, System Development Corporation, Santa Monica, CA, 1975.
- [Brachman, et.al, 80]. R. Brachman, B. Smith, "Special Issue on Knowledge Representation", Sigart Newsletter, no. 90, Feb. 1980.
- [Buchanan, 75]. B. Buchanan, "Applications of Artificial Intelligence to Scientific Reasoning", Proc. Second USAJapan Computer Conference, Tokyo, Japan, 1975.
- [Chandrasekaran, 79]. B. Chandrasekaran, "An Approach to Medical Diagnosis Based on Conceptual Structures", Proc. Sixth Int'l. Joint Conf. Artificial Intelligence, 1979.
- [Chilausky, 76]. R. Chilausky, B. Jacobsen, R. Michalski, "An Application of Variable-Valued Logic to Inductive Learning of Plant Disease Diagnostic Rules", Proc. Sixth Annual Int'l. Symp. Multiple-Valued Logic, 1976.
- [Davis, 76]. R. Davis, "Application of Meta Level Knowledge to the Construction, Maintenance and Use of Large Knowledge Bases", Stanford AI Laboratory Memo AIM-283, Report no. STAN-CS-76-552, Stanford University, Stanford, CA, 1976.
- [Davis, et.al, 77]. R. Davis, B. Buchanan, and E. Shortliffe, "Production Rules as a Representation for a Knowledge-Based Consultation Program", Artificial Intelligence, vol. 8, no. 1, 1977.
- [Davis, 81]. R. Davis, "The Dipmeter Advisor: Interpretation of Geological Signals", Proc. Seventh Int'l. Joint Conf. Artificial Intelligence, Aug. 1981.
- [Feigenbaum, 81]. E. F. Feigenbaum, A. Barr, The Handbook of Artificial Intelligence, Vols. 1,2,3, Harris Tech Press, Stanford, Calif., 1981.

- [Feigenbaum, 71]. E. Feigenbaum, G. Buchanan, J. Lederberg, "Generality and Problem Solving : A Case Study Using the DENDRAL Program", Machine Intelligence vol. 6, D. Meltzer and D. Michie, (Eds.), Edinburgh Univ. Press, Edinburgh, Scotland, 1971.
- [Forgy, 76]. C. Forgy, "A Production System Monitor for Parallel Computers", Computer Science Dept. Technical Report, Carnegie-Mellon Univ., Pittsburgh, PA, 1976.
- [Forgy, 77]. C. Forgy, J. McDermott, "OPS, a Domain-Independent Production System Language", Proc. Fifth Int'l. Joint Conf. Artificial Intelligence, pp 933-939, 1977.
- [Gevarter, 83]. W. Gevarter, "Expert Systems: Limited but Powerful", Spectrum, Aug. 1983.
- [Goguen, 68]. J. Goguen, "The Logic of Inexact Concepts", Synthese, vol. 19, pp. 325-373, 1968.
- [Hart, 78]. P. Hart, R. Duda, and M. Einaudi, "A Computer Based Consultation System for Mineral Exploration", Tech Report, SRI International, Menlo Park, Calif., 1978.
- [Hayes-Roth, 83]. F. Hayes-Roth, D. Waterman, and D. Lenat, (Eds.) Building Expert Systems, Addison-Wesley, Reading, MA., 1983.
- [Klahr, 78]. P. Klahr, "Planning Techniques for Rule Acquisition in Deductive Question Answerings", in Pattern Directed Inference Systems, D. Waterman and F. Hayes-Roth, (Eds.), Academic Press, New York, 1978.
- [Malhotra, 75]. A. Malhotra, "Knowledge-Based English Language System for Management Support: Analysis of Requirements", Proc. Fourth Int'l. Joint Conference on Artificial Intelligence, pp. 842-847, MIT AI Laboratory, Cambridge, MA, 1975.
- [Martin, 77]. N. Martin, "Knowledge-Base Management for Experiment Planning in Molecular Genetics", Proc. Fifth Int'l. Joint Conf. on Artificial Intelligence, 1977.
- [McCalla, et.al, 83]. G. McCalla, N. Cercone, "Approaches to Knowledge Representation", Computer, vol. 16, no. 10, Oct. 1983.

- [McDermott, 81]. J. McDermott, B. Steele, "Extending a Knowledge Based System to Deal With Ad hoc Constraints", Proc. Seventh Int'l. Joint Conf. on Artificial Intelligence, 1981.
- [Miller, 73]. P. Miller, "A Locally-Organized Parser for Spoken Input", Doctorial Thesis, Massachusetts Institute of Technology, Cambridge, MA, 1973.
- [Moses, 71]. J. Moses, "Symbolic Integration: The Stormy Decade", Comm. of ACM, vol. 14, no. 8, 1971.
- [Mylopoulos, et.al. 75]. J. Mylopoulos, A. Borgida, P. Cohen, and N. Roussopoulos, "TORUS - A Natural Language Understanding System for Data Management", Proc. Fourth Int'l Joint Conf. on Artificial Intelligence, pp. 414-421, MIT AI Laboratory, Cambridge, MA, 1975.
- [Nau, 83]. D. Nau, "Expert Computer Systems", Computer, vol. 16, no. 2, Feb. 1983.
- [Nii, 78]. H. Nii, E. Feigenbaum, "Rule-Based Understanding of Signals", Pattern-Directed Inference Systems, D. Waterman and F. Hayes-Roth, (Eds.), Academic Presss, New York, 1978.
- [Nilsson, 80]. N. Nilsson, Principles of Artificial Intelligence, Tioga Publishing Co., Palo Alto, CA, 1980.
- [Osborn, 79]. J. Osborn, "Managing the Data from Respiratory Measurements", Medical Instrumentation, vol. 13, no. 6, Nov. 1979.
- [Pople, 77]. H. Pople, "The Formation of Composite Hypotheses in Diagnostic Problem Solving: An Exercise in Synthetic Reasoning", Proc. Fifth Int'l. Joint Conf. Artificial Intelligence, 1977.
- [Reddy, 73]. R. Reddy, R. Fennell, R. Neely, "The HEARSAY Speech Understanding System: An Example of the Recognition Process", Proc. Third Int'l. Joint Conf. Artificial Intelligence, pp 185-193, 1973.
- [Reddy, 75]. R. Reddy, (Ed.) Speech Recognition: Invited Papers of IEEE Symposium, Academic Press, New York, N.Y., 1975.

- [Shortliffe, 76]. E. Shortliffe, Computer-Based Medical Consultations: MYCIN, American Elsevier, New York, N.Y., 1976.
- [Shortliffe, 75]. E. Shortliffe, B. Buchanan, "A Model of Inexact Reasoning in Medicine", Mathematical Biosciences, vol. 23, pp 351-379, 1975.
- [Stallman, 77]. R. Stallman, G. Sussman, "Forward Reasoning and Dependency-Directed Backtracking in a System for Computer-Aided Circuit Analysis", Artificial Intelligence, vol. 9, pp 135-196, 1977.
- [Stefik, 77]. M. Stefik, N. Martin, "A Review of Knowledge Based Problem Solving as a Basis for a Genetics Experiment Design System", Computer Science Dept., Heuristic Programming Project memo HPP-75-5, Stanford Univ., Stanford, C.A., 1977.
- [Tversky, 72]. A. Tversky, "Elimination by Aspects: a Theory of Choice", Psychological Review, vol. 79, pp 281-299, 1972.
- [Weiss, 78]. S. Weiss, "A Model-Based Method for Computer-Aided Medical Decision-Making", Artificial Intelligence, vol. 11, no. 2, 1978.
- [Wiederhold, 84]. G. Wiederhold, "Knowledge and Database Management Systems", Software, vol. 1, no. 1, Jan. 1984,
- [Winograd, 75]. T. Winograd, "Frame Representations and the Declarative/Procedural Controversy", in Representation and Understanding: Studies in Cognitive Science, D. Bobrow, A. Collins (Eds.), pp. 188-210, Academic Press, New York, NY, 1975.
- [Winston, 77]. P. Winston, Artificial Intelligence, Addison-Wesley, Reading, MA, 1977.
- [Zadeh, 75a]. L. Zadeh, "Fuzzy Logic and Approximate Reasoning", Synthese, pp 407-428, vol 30, 1975.
- [Zadeh, 75b]. L. Zadeh, "The Concept of a Linguistic Variable and its Application to Approximate Reasoning - I", Information Sciences, vol. 8, no. 3, pp. 199-249, 1975.

ATTACHMENT 4.7

"CONCEPTS AND IMPLEMENATIONS OF
NATURAL LANGUAGE QUERY SYSTEMS,"

I-HSIUNG LIU,

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CONCEPTS AND IMPLEMENTATIONS
OF
NATURAL LANGUAGE QUERY SYSTEMS

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ABSTRACT

The currently developed user language interfaces of information systems are generally for experienced users. These interfaces commonly ignore potentially the largest user group, namely, casual users. This project discusses the concepts and implementations of a natural query language system which satisfy the nature and information needs of casual users by allowing them to communicate with the system in the form of their native language. In addition, a framework for the development of such an interface is also introduced for the MADAM (Multics Approach to Data Access and Management) system at the University of Southwestern Louisiana.

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CONCEPTS AND IMPLEMENTATIONS
OF
NATURAL LANGUAGE QUERY SYSTEMS

1. THE IMPORTANCE OF NATURAL LANGUAGE QUERY SYSTEMS

The major function of a computerized information system is to enable its users to retrieve and modify any subset of the data in the data bases, as well as to provide support to its users in their decision-making activities. In other words, the computerized information system is developed to serve its users and satisfy their immediate needs for information. Thus, the success or failure of an information system is ultimately decided by the users the system is supposed to serve.

The predominant criterion in evaluating an information system, from the user's viewpoint, is whether the system allows him to freely communicate to it and satisfy his needs. Therefore, the interface problem in user-system interaction must be seriously considered while developing an information system. The concept of a multi-user query system is, therefore, applied in the development of most information systems to allow different user groups to communicate with the system by using specific data base sublanguages. But, these multi-user query systems all too

often ignore the nature of the largest group of the user population - casual users.

Casual users, as defined in [Codd, 74] are ones "whose interactions with the system are irregular in time and motivated by (their) jobs or social roles." Such users may not only lack knowledge about computers, programming, logic, or relations, but also are not willing to learn an artificial language. The only query language which they are willing to use to interact with a data base system is their native language.

After examining the characteristics of casual users, it is conceivable that the traditional approach of query language design, which assumes that the users are willing to develop the appropriate skills and learn the "user-supports" to operate an information system, cannot cope with the nature of those casual users. For example, Query-By-Example has been proven by many behavioral researches [Greenblatt, 78; Waxman, 78; Zloof, 78] to be an easy-to-use query language for non-programmer users. But, before a user can manipulate this language, he still requires about three hours or four sessions of instruction and a knowledge of first-order predicate calculus. In order to satisfy the information need of casual users, therefore, a natural language query system should be developed so that the casual users can freely employ their native languages to specify what they want

while interacting with the system.

The purpose of this project is to briefly examine the current development of natural language query systems, and present a framework for such a system for the "SEARCH" subsystem of MADAM. Finally, the difficulties involved in the construction of such a query system will be evaluated and some solutions to those problems are proposed for future studies.

2. METHODOLOGY

Recognizing the importance of a natural language query system, considerable research has been performed in this field during the last decade [Codd, 74; Lockemann, 75; Waltz 77; Goodman, 77]. This project intends to examine these research activities and, based on the knowledge obtained through the above work, to propose a framework for the development of a natural language query system within MADAM.

By definition, a "framework" identifies the relationships between the parts, and reveals the areas in which further development will be required [Spragne, 1980]. Thus, in this project, it is necessary to examine the relationships between the natural language query system and the existing subsystems of a database system, especially the "SEARCH" subsystem, as well as

the relationships between various components in the natural language query system itself. In addition, issues addressing the development of such a system, such as the restrictions and the reasonable alternative approaches to developing such a query system, are to be discussed.

To accomplish the above purposes, the method applied in this project is a library research approach. The research proceeded in the following five steps:

- (1) To discuss the concepts of a natural language query system. The major concern lies in the conceptual relationships between the natural language query system and other database sublanguages within the database system, as well as the relationships between components within a natural language query system.
- (2) To discuss the implementation of the above relationships.
- (3) Based on the above discussions, to generate a framework for the development of a natural language query system for MADAM.
- (4) To discover the difficulties involved in the development of the above system.

- (5) To propose some directions to solve the above problems.

3. CONCEPTS OF NATURAL LANGUAGE QUERY SYSTEMS

The primary objective of a natural language query system is to permit casual users to engage in effective communication with a formatted database system by applying their native language. To develop such a query system, it is necessary to understand the interrelationships between the natural language query system and the database system, as well as the interrelationships between the components within the natural language query system. In this section, these relationships are examined, and the implementation of these relationships will be discussed in the next section.

3.1 Relationships Between Natural Language Query Systems and the Data Base System

The data base design can be separated into at least three design levels (Figure 3-1). The first level, the user's logical level or information structure level, is the logical representation of "facts" in reality. The second level, data base level or system's logical level, is not visible to the users and at this level, the logical structuring of data is shown. The

third level is the physical storage structure level where the data are actually structured and stored in secondary storage.

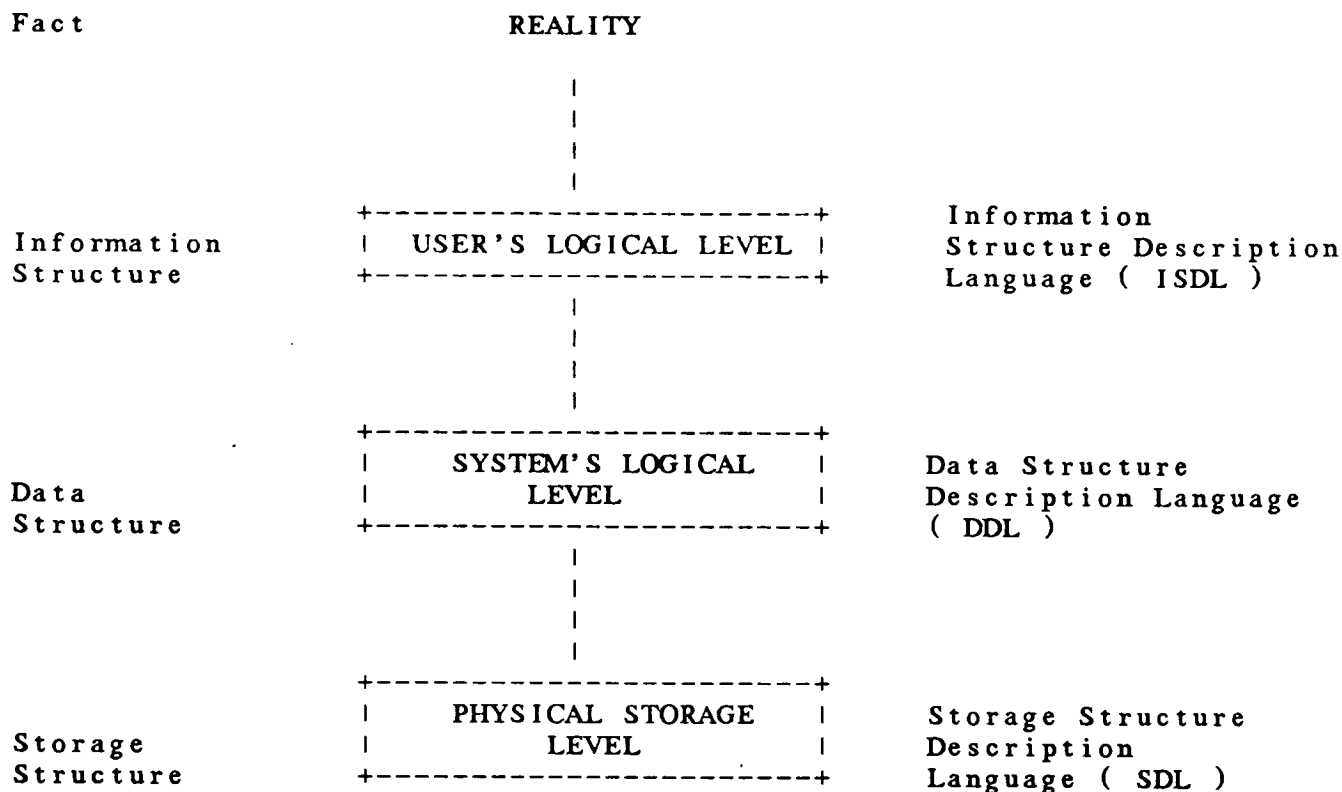


FIGURE 3-1 Levels of Data Base Design [Nijessen, 1974]

While using a query language to retrieve information from a data base system, the casual user is supposed to know "what 'fact' he wants to obtain from the system and how to express his intention in his preferred language", instead of knowing "how to access the data from the data base system". Thus, a good query language should be based on the concepts of the data description model and try to avoid as many as possible of the concepts which are machine dependent [Ghosh, 77]. Currently developed query languages for casual users are mainly of the form of restricted English, such as SEQUEL [Boyce, 1974] and QUERY-BY-EXAMPLE [Zloof, 1978]. Although these languages have a high degree of machine independence, they are not "natural" to casual users [Greenblatt, 78; Waxman, 78]. As Codd suggested, the only way to entice the casual user to interact with a data base system is to permit him free use of his native language. Therefore, the development of a natural language query system is necessary and important. The following discussion explains that the development of such a query system that relates to an existing data base system is possible by extending the concept of the hierarchy of user languages.

3.2 Hierarchy of User Languages

The hierarchy of data base interfaces, as presented in

Kraegeloh's description [Kraegeloh, 75], can be defined as follows:

- (1) Each interface is defined in terms of a lower interface, and may itself serve as the basis for definition of a higher interface.
- (2) There is exactly one interface which cannot be defined in terms of another interface and hence serves as the ultimate basis for all other interfaces.

Following the above definition, [Lockemann, 75] introduced some general rules on the design of user languages. He claimed that, keeping to those rules, a new interface can be defined in terms of its immediate predecessor, and at any level of the hierarchy, a user can formulate his queries without the necessity of knowing the language existing in the lower levels.

Based on their concepts, it is obvious that one possible step of abstraction is the definition of a new interface level which accepts natural language as input. To this new interface, the existing high level query language such as SEQUEL becomes the immediate predecessor. This query language, acting as the intermediate of the natural language, translates the natural language input into a formal query language, processes it down to

the lowest level of the hierarchy, and then translates the results or responses into the natural language acceptable to the user.

3.3 Development of Natural Language Query Systems

The above discussion claims that a natural language query system is possible to be developed on the existing hierarchy of user languages. Some systems that support natural language have already been developed both in the DBMS and AI research fields, such as RENDEZVOUS, LUNAR, ELIZA and PLANES. The major difference among those systems lies in the emphasis on the type of dialogue which the system uses to communicate with its users. Those types of dialogue are as follows [Codd, 1974]:

Stroking Dialog

In this approach, when the system receives the queries from its user, it assures the user that it has been listening to him and invites him to continue his queries. Weigenbaum's ELIZA is of this type.

Contributive Dialog

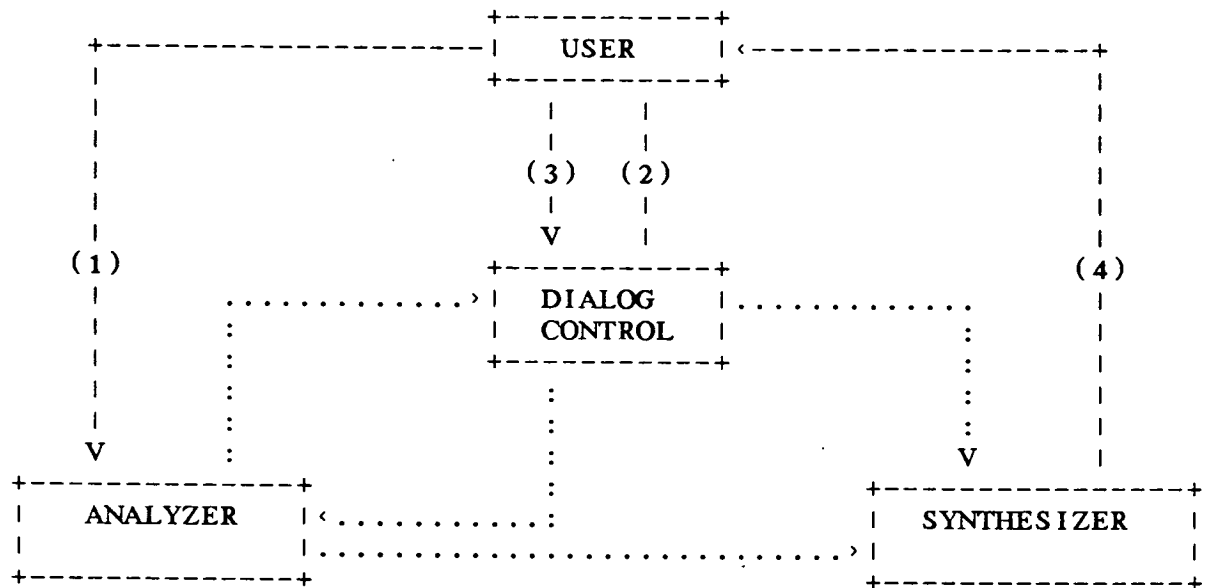
In this approach, dialog involves contributive utterances and questions about changes of state in the given environment,

but not questions about the meaning of previous utterances. Winograd's SHURDLU is of this type.

Clarification Dialog

In this approach, dialog involves queries about previous utterances in the dialog. Codd's RENDEZVOUS and its version 1, version 2 and Waltz's PLANES are of this type.

Although there are some distinctions among the above approaches and systems, the ideas about the structure of a natural language query system which built up the user-system interaction are quite similar as shown in Figure 3-2. This diagram shows the interaction between the user and the major components of the natural language query system, as well as the relationships between those components.



-----> Natural Language

.....> Formal language

FIGURE 3-2 Components of a Natural Language Query System

3.4 Relationships Between Components of the Natural Language Query System

In Figure 3-2, the relationship of three major components of a natural language query system are identified, and the system processes user query as follows:

- (1) The user initiates his request in the form of his native language which may be both syntactically and semantically complete, or it may involve certain ambiguity resulting from syntax errors, incompleteness or semantic incompatibility. After the analyzer of the system language processor receives the query, it first reduces the redundant words or phrases in the query; then analyzes the syntax of the query and its semantics; third, the results of the analysis are used to generate a formal query defined by the system. This formal query may be incomplete either syntactically or semantically. If it is so, then the formal query is transmitted to the dialog control. The dialog control examines the logical completeness of the query, and decides what strategy the system should apply to communicate with the user in order to achieve the logical completeness of the formal query.

- (2) The decision is used to generate a question, usually in the form of multiple-choice, and transmitted to the user.
- (3) After the user provides additional information, the dialog control examines the logical completeness and repeats the above procedure until the objective is achieved. After the logically complete query is generated, the data sublanguage statements are transmitted to the synthesizer.
- (4) The synthesizer, after received the formal query, transforms it into a precise natural language restatement based on the formal query, and transmits this restatement back to the user.

If the user approves the system restatement, then the analyzer informs the synthesizer so that it can initiate the data retrieval operations. Otherwise, the above process will be repeated until there is an agreement reached between the user and the system.

The next part in this section explains the functions of each component involved in this four-step process.

3.4.1 The Analyzer

The analyzer performs three major functions: first, it translates as much as possible of the user's query into a data base language; second, it discovers and analyzes the translation difficulties such as the ambiguity involved in the query, as well as generates sufficient parameters to enable the dialog control to piece together dialog appropriate to the state of translation and the state of the user interaction; finally, it provides interpretation of the user's response.

The way an analyzer performs the above functions is based on the technique of the implementation. In general, there are two consecutive operations involved in the analyzer: parsing and interpretation. In the parsing phase, the user's request is transformed into normalized form by reducing the redundant words or phrases. In the interpretation phase, the feature and value representation of the user's request is translated into the formal query language, which then will be used to proceed to the actual information retrieval activity.

3.4.2 The Dialog Control

The dialog control provides a base for experimentation with dialog styles and tactics. For example, it is the mechanism to

express how fully the user is kept informed of the system's progress in understanding his input and what type of dialog the system should generate in responding to the user's query.

The decisions on the construction of "re-statement" or "para-phrase" feedback to the user are the operations involved in this component. This feedback ensures that the further operation of the system will be consistent with the user's intention, or it clarifies the segment of the user's query which the system is unable to understand.

3.4.3 The Synthesizer

The synthesizer is responsible for translating the system's response, a restatement or the answer, back into natural language from the formal data sublanguage.

The above three principal components are fundamental to all the natural language query systems. Therefore, in implementing such a system, the implementor has to ensure that the system's design is able to perform the functions required in each component. In the next section, the implementation of two sample natural language query systems, RENDEZVOUS and PLANES, are overviewed to examine the techniques required in implementing such a query system.

4. IMPLEMENTATION OF NATURAL LANGUAGE QUERY SYSTEMS

The discussion of the implementation of a natural language query system in this project is to be divided into three parts: first, to describe the general rules for developing such a system; second, to overview a block diagram developed by Codd [Codd, 78] which includes the concepts discussed in the previous section; and finally, to discuss the functional performance of the implemented systems.

4.1 The General Rules of the Implementation

In his "Seven Steps to Rendezvous With the Casual User", [Codd, 74] proposed seven steps required in the implementation of a natural language query system. They are:

(1) Selecting a simple data model which can describe the data in a relatively simple way, both syntactically and semantically

The selection of a data model is strongly affected by the fact that data definition would be performed by untrained personnel. It is believed that, in terms of the logical view of the data, the relational data model is by far the most comprehensible to the non-computer-professional user. The requirement that all data be in tables, with named field specifiers, unique keys, and no multiple-valued field entries,

would guarantee first normal form without causing conceptual difficulty on the part of the user. Unlike CODASYL DBTG systems, where the relationships among data items are explicitly stated via set relationships and the data manipulation language must navigate among the sets, in a relational scheme the data can remain simple in structure and the complexity can be buried in the access methods employed by the software, which are invisible to the user. The ability of the relational systems to create new relationships among data items in response to each new query also results in efficient use of space, as a complex network of links and pointers does not have to be maintained.

Based on the above comparison between two mainstream data models, by selecting the relational model, the user, particularly the casual user, can be effectively isolated from the actual data base organization, and this is also the main reason that both the RENDEZVOUS and PLANES systems apply the relational approach.

(2) Selecting a high level logic as the internal target

In the natural language query system, the user expresses his request by using potentially poorly formulated language statements. This informal query may be ambiguous and/or semantically incompatible with the data base description. In order to enable the system to detect those problems, the user's

source statements have to be translated into an internal, precise language which is acceptable to the system. The data sublanguage ALPHA, a relational calculus language [Codd, 1971], which was selected as the internal target by both RENDEZVOUS and PLANES, and DEDUCE, which was selected by RENDEZVOUS 1 and 2, are examples. The reason for selecting such a relational calculus language is because of its simplicity, completeness, nonprocedurality and extensibility. Most of all, "the ALPHA-like languages provide a common core of features that will be required in some shape or form in all natural languages" [Codd, 1974, 1978].

(3) Introducing a strategy by which the system can keep the dialog closely tied to the data base description and the user's intended query

Most often, a user's query, while in the form of natural language, will omit information necessary to form an adequate query, such as ellipsis, using pronouns instead of nouns, or missing necessary information. There are many different strategies that have been applied to allow the system to address these problems. In RENDEZVOUS, the analyzer simply ignores the incomprehensible words, during the analysis stage, translating the remaining comprehensible words into formal languages, and piecing them together to determine what things are missing. In

PLANES, in addition to the above strategy, a context register, the history keepers which store all semantic constituents of user's requests and answers to earlier questions and other information, and concept case frames, a template representation of an entire series of questions about the data base, are used by the analyzer. By applying the concept of pattern matching, if incomprehensible words are encountered, the analyzer looks back through past context register values to fill in missing elements in order to solve the above problems, and to extend the system's ability in the future analysis process.

(4) Introducing system re-statement of user's query

The purpose of the introduction of re-statement is to ensure that the system has correctly interpreted the user's query.

(5) Separating query formulation from the data base search

The purpose of this separation is to protect the user from what may be expensive searches for information he does not want.

(6) Employing multiple-choice interrogation as fall-back

When a user's query consists of certain words or phrases which are incomprehensible to the system such as a syntax error, undefined data item or record, or certain misspelled words, and the system cannot generate a formal query without understanding

them, the system needs to form multiple-choice question as a fall-back in order to prevent further problems with the interaction between the user and the system.

(7) Providing a definition capability

In a non-dialog environment, the user must observe the need for a definition and supply it to the system's library of definitions. But in the dialog environment of the natural language query system, the system must take this responsibility; it must detect the needs for definitions and extract them for the user.

4.2 A Block Diagram of a Natural Language Query System

By examining the research in the natural language query systems, particularly in Lockemann's KAIFAS, and Codd's RENDEZVOUS and its version 1, a block diagram which presents the structure of a natural language query system and describes the relationships between components of such a system can be introduced as Figure 4-1.

4.2.1 Analyzer

The analyzer, as mentioned in the previous section, has three major functions:

- (1) To translate as much as possible of the user's query into a data base sublanguage.
- (2) To discover and analyze the translation difficulties, as well as generate sufficient parameters to enable the dialog control to piece together dialog appropriate to the state of the translation and the state of the user interaction.
- (3) To provide interpretation of the user's response.

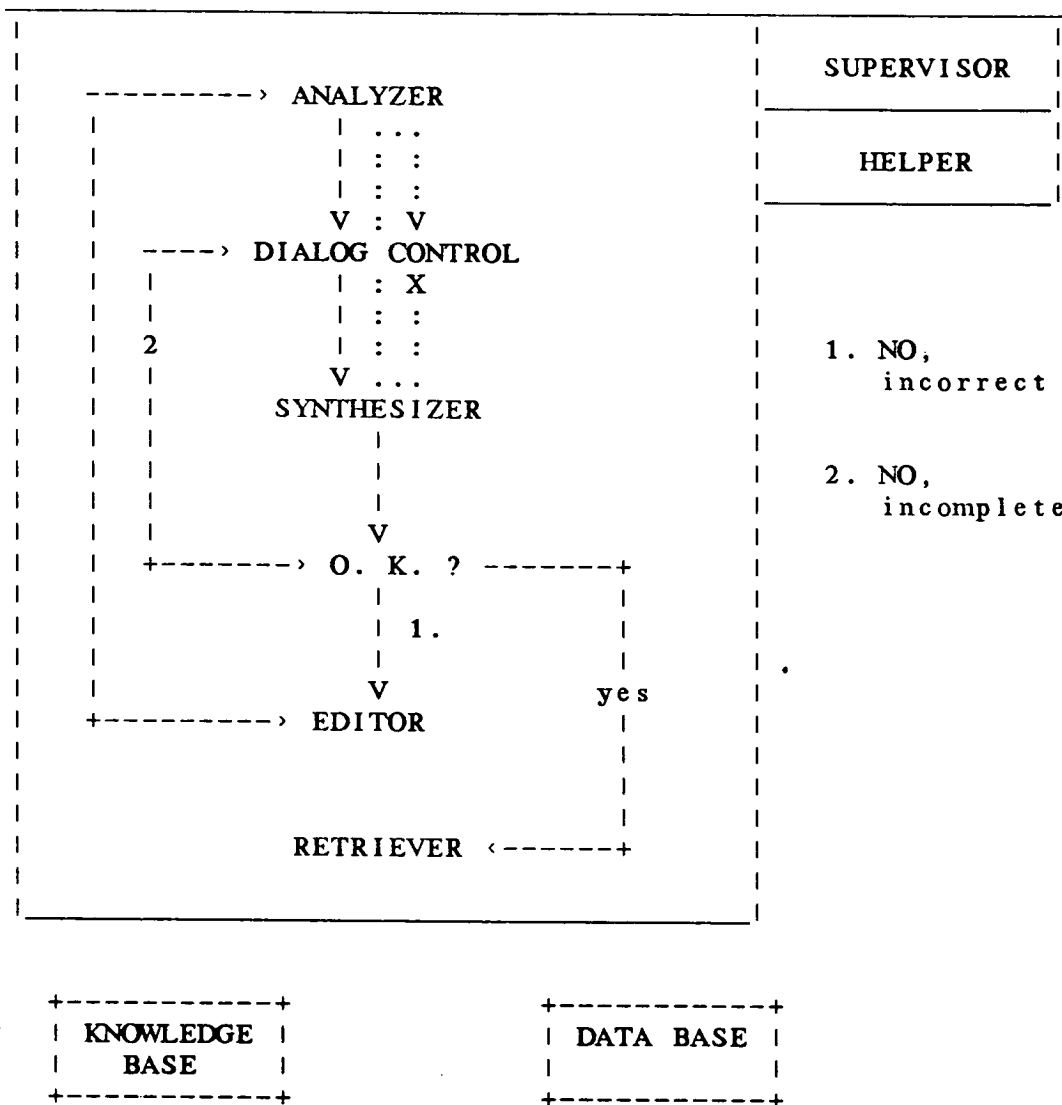


FIGURE 4-1 A Block Diagram of a Natural Language Query System

The way an analyzer perform these functions is based on the implementation of the system. In general, the operations of the analyzer have been implemented as two types of analysis, namely, the syntactical analysis, which is used to reduce redundancies, and the semantic interpretation. For example, in RENDEZVOUS, the concept of transformational grammars [Barr 81; Feigenbaum, 81] is applied in the syntactical analysis: the analyzer, first, by using standard suffix transformations, drops redundant words such as "please" and transforms the words in the user's query into a normalized form independently; then, the phrase transformer recognizes the types of phrases and replaces them by phrases which are syntactically closer to the formal query language. In the interpretation phase, some of the phrase transformation rules, which are called "semantic templates", are applied to check the semantic compatibility of phrase components with one another by using the data description as the guide.

In the PLANES system, the above operations are further divided into four steps: first, the words of the user query are evaluated and substituted with the canonical words and synonyms, redundant words being reduced and ignored; second, the semantic ATNs (Augmented Transition Networks) are applied to the input request in order to determine the specific meaning of each phrase; third, concept case frames are applied to the above

phrases in order to find the pattern of the question; and finally, the filled-in concept case frame is translated into a formal query expression for use with the relational data base system in the information retrieval phase.

4.2.2 The Dialog Control

The Dialog Control takes the analyzer output, tests its logical completeness, and poses only those questions to the user that will yield a logically complete formal query. In order to produce a logically complete formal query for the information retrieval phase, the dialog control needs to determine certain tactics to allow the system to interact with the user so that the ambiguity involved in the user query can be clarified.

4.2.3 The Synthesizer

The Synthesizer translates the logically complete formal query output from the Dialog Control into a precise natural language re-statement. The operation of the synthesizer is the process of text generation [Barr, 81; Feigenbaum, 81]. The implementation of this process employs essentially the same concepts and grammar rules as the analyzer.

4.2.4 The Retriever

This component is invoked only when the user has approved the re-statement. After the retriever is invoked, it takes the logically complete formal query from the Dialog Control and retrieves data from the data base in order to generate an answer to that query. This retrieved answer is output to the synthesizer which then translates it into a precise natural language statement to the user. Thus, the major operation of the retriever is data base search. To process this operation, it is necessary to construct a set of search programs (generally written in LISP, APL or Pascal). By applying this set of search programs, the system performs following operations sequentially:

- (1) Selecting the relations or files to be searched.
- (2) Selecting an order for searching these files.
- (3) Generating an expression for testing and selecting tuple values to return while searching.
- (4) Generating a program to combine data, possibly from a number of different relations, so that the proper answer will be returned.
- (5) Deciding when to save the results of a search for

future use.

In addition to the above four major components, there are some equally important components that need to be implemented in the development of a natural language query system. The main function of these components is to provide support to the user, analyzer, dialog control and synthesizer during their interactions. These components are briefly described as follows:

- (1) KNOWLEDGE BASE: This provides time-independent semantic and linguistic information about the data base to allow the system to interact with reasonable intelligence concerning any natural language query whose formal counterpart lies within the class of formal queries supported as an internal interface (e.g. transformation rules for words and phrases).
- (2) EDITOR: This provides a menu for the user to change his query or the system's version.
- (3) HELPER : This provides a menu for the user to obtain general information about the kinds of data stored in the data base.
- (4) SUPERVISOR: This component is responsible for invoking

each of the components cited above whenever appropriate.

The most important function provided by a natural language query system is that the system completely protects casual users from any data sublanguage; on the other hand, experienced users may still use the data sublanguage defined by the system to process their query.

5. NATURAL LANGUAGE QUERY SYSTEM FOR MADAM

MADAM is a bibliographic information storage and retrieval system developed within the DBMS Project of the Computer Science Department at the University of Southwestern Louisiana [Dominick, et. al., 80]. This system includes three major subsystems: Data Base Search Subsystem, Data Base Administration Subsystems, and System Administration Subsystem.

Prior to communicating with the MADAM system for information needs, users have to learn to handle a set of system commands. This requirement may keep casual users away from using such a system, or limit their use of the system. Thus, to serve this user group, the development of a natural language query system for MADAM is necessary. In this section, a framework for such a subsystem within the MADAM system is proposed based on the

discussion in the previous sections.

In the framework presented here, the application of the natural language query sub-system is restricted and prepared only for the Data Base Search Subsystem of MADAM. The major reasons for imposing such a restriction are as follows:

- (1) Among the three subsystems within MADAM, the users of the Data Base Administration and System Administration Subsystems are typically information system and database professionals. Those who can use only the Data Base Search Subsystem may be the users who need a natural language query system.
- (2) The currently developed natural language query systems, such as RENDEZVOUS, PLANES and LUNAR, are mainly concerned with fact retrieval rather than updating data values or modifying data bases. The major reason for this development approach is that data base search is the primary function of any information system [Wiederhold, 83]. Thus, it is reasonable to develop a natural language query system for the Data Base Search Subsystem at the pilot stage.

The framework proposed here is organized into two major parts. The first part specifies four levels of the information retrieval process and describes required modifications to the existing MADAM system; the second part suggests a development approach for the natural language query system.

5.1 Four Levels of the Information Retrieval Process

It is helpful to describe how the system understands a user's query in the form of natural language, processes it, produces correct answer, and generates response to the user in the form of natural language. In this framework, the above process can be divided into four levels (see Figure 5-1). In the discussion on this subject, the first two levels are of primary concern since the introduction of these two levels would provide MADAM with the capability to understand and answer queries in the form of natural language in addition to formal query language commands.

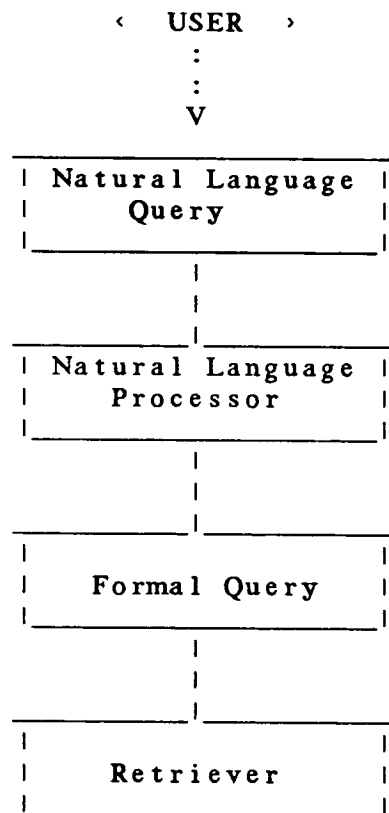


FIGURE 5-1 Four Levels of the Information Retrieval Process

5.1.1 Natural Language Level

This level is the interface level of the casual user-system interaction. At this level, the user and the system communicate with each other in the form of natural language (dialog and/or multiple-choice questions). Each information retrieval activity is initiated when a user inputs his query and is actually terminated when the system's response is accepted by its user at this level.

The techniques involved in the design of this level is the capability of the system in translating natural language input into a system defined formal language and that of the natural language output generation. Each time the system generates a re-statement of the user's query, it should output the re-statement along with the user's query so that the user may compare his own query with the system's perception of his query. If the system finds any ambiguity in the user's query, it may generate questions in the form of a multiple-choice questions along with some hints and the user's source statement so that the user may review his intention and modify the query statement using the assistance provided by the system.

5.1.2 Natural Language Processor

The user query in the natural language query system is non-procedural and informal; on the other hand, the commands used in the Data Base Search Subsystem of MADAM are non-procedural, but highly structured and formal. Thus, it is necessary to have a natural language processor which can perform the syntactical and semantic analysis on a natural language user query and generate a formal query acceptable by the existing system.

The design of such a processor, based on the discussion in the last sections and especially Figure 3-1 and Figure 4-2 should include the analyzer, the dialog control and the synthesizer, as well as other assistance components such as the knowledge base and helper.

The basic work of the analyzer is to transform the natural language query, syntactically and semantically, into one of three types of formal query expressions in the Data Base Search Subsystem by applying the grammar rules, relations, tuples and operators stored in the knowledge base. The synthesizer performs the same function in the reverse direction.

In designing these two components, as discussed in the previous sections, the designer should, first, construct a set of grammar rules based on the relations in the data base and the

selection of appropriate techniques of natural language understanding, such as transformational grammars and case grammars; second, develop a knowledge base of sufficient size and capability. This knowledge base, which must be installed into the MADAM system will serve as the brain of the Natural Language Processor in natural language understanding. Thus, the design of such a knowledge base is not only important but critical to the success of the natural language query system.

Different from most developed natural language query systems, in which a relational calculus language, ALPHA, is applied as data sublanguage, the formal query applied in MADAM is a higher-level language. Thus, in the design of this phase, a two-step translation may be required. In this process, a relational calculus language may be used as an intermediate between natural language query and the data sublanguage used by the MADAM system.

The Dialog Control needs to check the logical completeness of a user query and pose questions to the user in order to organize a logically complete formal query. Thus, some semantic analysis techniques such as ATNs should be considered in the design of this component.

The helper component will be constructed by modifying the

help commands in the MADAM Data Base Search Subsystem so that the result of each "help" command can be presented in a form of precise natural language.

Since the Natural Language Processor performs many functions and operations, it is necessary to have a driver which invokes the appropriate operation by initiating a specific subroutine mentioned above based on the state of the transformation process. Therefore, it is necessary to design a Supervisor routine to invoke and supervise various operations.

5.2 The Development Approach for the Natural Language Query System

It is predictable, in the development of a natural language query system within MADAM, that many problems and difficulties will be encountered, for example, how large of the knowledge base is required for such a system? Can the system being developed understand any natural language query? How many rules are needed to be generated for the syntactic and semantic transformation?

5.2.1 The Traditional Approach of Query System Design

Traditionally, commercially available database systems usually offered comparatively general-purpose interfaces which

were suitable only for "DB specialists". Under this approach, two basic assumptions on the users of computerized information system were widely accepted. The assumptions and their critiqueing references are:

- (1) Whenever a user conceives a query, he can convey his intent to the system faithfully and precisely [Codd, 74].
- (2) The user is willing to develop the appropriate skills and learn the "user-supports" to operate an information system [Eason, 75].

Since the user group of a natural language query system is casual users, the above assumptions are obviously invalid. For example, many researchers have found that, when using an information system, the casual user tends to expect a tool which fits his needs and does not expect to modify his own behavior to fit the system needs. Additionally, the requirement of learning formal query languages usually causes one of three responses:

- (1) Non-use of the system.
- (2) Limited use of the system.

(3) The use of a human intermediary.

Therefore, in order to develop a natural language query system which can provide an effective casual user-system interface, traditional thinking concerning the nature of users must be adjusted.

5.2.2 Experimental Approach

To adjust the traditional approach of query system development, this project proposes an experimental approach. The fundamental assumption of this approach is that, in an information system providing a natural language interface, the system has to "think" and "speak" as its user, a human being. Based on this assumption, the designer has to understand the mainstream concepts of behavioral science, such as learning psychology and human communication theories, as well as of natural language understanding and knowledge representation in the AI field.

Based on the concepts of behavioral sciences, it is reasonable to understand that it is impossible, at the early stage of development, to have a system whose "experience" and "intelligence" allows it to understand all the queries or issues of human conversation, and to use natural language fluently. On

the contrary, a natural language query system should have a limited capability of both natural language understanding and natural language generation, and this capability should grow gradually by the increase of its "experience" and "vocabulary".

The experimental approach proposed in this project is based on the above consideration. The development of a natural language query system should be accomplished by consecutive experiments. In each experiment, the designer should restrict the scope of queries in limited topics and obtain certain distinct natural language requests in these topic areas through interviewing "sampled" casual users; then, develop a subset of a natural language query system which has the ability to "understand" these queries and "respond" to these queries. The developed system, then, should be integrated with previous developed subsets of the system. In such a way, the knowledge base of the system can be expanded as well as the system's ability to understand and use the natural language.

6. CONCLUSION

Computerized information systems are created for the benefit of the end users. According to Codd's estimate [Codd, 71], "by the mid 1990s, the home/casual user of such systems will be the dominant factor in the total utilization of database resources". If computerized information systems are to become everyday tools of casual users, the needs and desires of the casual users must be accommodated. Therefore, the development of natural language query systems must become a major trend in information system development.

REFERENCES

- [Abrial, et.al, 74]. J. R. Abrial, "Data Semantics," in J. W. Klimbie and K. L. Koffemann(eds.), Data Base Management, North-Holland Co., 1974, pp. 1-59.
- [Amble, et.al, 79]. T. Amble, K. Bratbergsengen, and O. Risenæs, "ASTRAL: A Structured and Unified Approach to Data Base Design and Manipulation", in Bracchi and Nijssen(eds.), Data Base Architecture, North-Holland Co., Holland, 1979.
- [Anderson, et.al, 78]. N. D. Anderson, and W. A. Burkhard, "MINISEQUEL : Relational Data Management System", in B. Shneiderman (eds.), Data Bases: Improving Usability and Responsiveness, Academic Press, London, 1978.
- [Barr, 81]. Barr, Avron and E. A. Feigenbaum, The Handbook of Artificial Intelligence, vol. 1., Heuristech Press, Stanford, 1981.
- [Boyce, et.al, 74]. R. F. Boyce, "Specifying Queries as Relational Expressions", in J. W. Klimbie and K. L. Koffemann (eds.), Data Base Management North-Holland Co., 1974.
- [Bretmann, et.al, 79]. B. Bretmann, E. Falkenberg and R. Mauer, "CSL: A Language for Defining Conceptual Schemas", in Bracchi and Nijassen (eds.), Data Base Architecture, North-Holland, 1979.
- [Codd, et.al, 71]. E. F. Codd, "A Database Sublanguage Founded on the Relational Calculus", Proc. ACM-SGFIDET Workshop on Data Description, Access and Control, Nov. 1971, ACM, N.Y., 35-68.
- [Codd, et.al, 74]. E. F. Codd, "Seven Steps to Rendezvous With the Casual User," in J. W. Klimbie and K. L. Koffemann (eds.), Data Base Management, North-Holland Co., 1974, pp. 179-199.
- [Codd, et.al, 78]. E. F. Codd, "How About Recently?", in B. Shneiderman (eds.), Data Bases: Improving Usability and Responsiveness, Academic Press, London, 1978, pp. 3-28.

- [Daniels, et.al, 82]. D. Daniels, "An Introduction to Distributed Query Compilation in R*", in H. J. Schneider (eds.), Distributed Data Bases, North-Holland Co., 1982, pp. 291-309.
- [Date, 77]. C. J. Date, An Introduction to Database Systems (2nd ed.), Addison-Wesley Co., Reading, Mass., 1977.
- [Dominick, 82]. W. D. Dominick, C. D. Michelson, and M. U. Farooq, MADAM User Guide, USL Computer Science Department, Lafayette, LA, 1982.
- [Eason, et.al, 75]. K. D. Eason, L. Damodaran, and T. F. M. Steward, "Interface Problems in Man-Computer Interaction", in E. Mumford and Sackman (eds.), Human Choice and Computers, North-Holland Co., 1975, pp. 91-105.
- [Ghosh, 77]. S. P. Ghosh, Data Base Organization for Data Management, Academic Press, New York, N. Y., 1977.
- [Greenblatt, et.al, 78]. D. Greenblatt, and J. Waxman, "A Study of Three Database Query Languages", in B. Shneiderman, Data Bases: Improving the Usability and Responsiveness, Academic Press, London, 1978, pp. 77-97.
- [Grosz, et.al, 77]. B. J. Grosz, "The Representation and Use of Focus in a System for Understanding Dialog", 5th International Joint Conference On Artificial Intelligence -1977, vol. 1, MIT, 1977, pp. 67-76.
- [Haseman, 77]. W. D. Haseman, and A. B. Whinston, Introduction to Data Management, Irwin Inc., 1977, pp. 202-226.
- [Jackson, 74]. P. C. Jackson, Introduction to Artificial Intelligence, Petrocelli/Charter, N. Y., 1974, pp. 169-342.
- [Kalinichendo, 74]. L. A. Kalinichendo, and V. M. Ryvkin, "Problems of High Level Database Access Language Implementation in Inverted Storage Structure Environment", in Klimbie and Koffemann (eds.), Data Base Management, 1974, pp. 201-209.
- [Lockemann, 75]. P.C. Lockemann, "Data Base User Language for the Non-programmer," University Karlsruhe: D-75 Karlsruhe 1, pp. 183-212, 1975.

- [Merrett, 74]. T.H. Merrett, "The Extended Relational Algebra, a Basis for Query Languages," in B. Shneidermann (ed.), Data Bases: Improving Usability and Responsiveness, pp. 99-128, 1974.
- [Nijssen, 74]. G.M. Nijssen, "Data Structuring in the DDL and Relational Model," in Klimbie and Koffemann (eds.), Data Base Management, pp. 363-379, 1974.
- [Schank, et al, 1981]. R.C. Schank and C.K. Riesbeck, "Inside Computer Understanding," Hillsdale: Lawrence Erlbaum Asso., 1981.
- [Spragne, 1980]. R.H. Sprague, "A Framework for the Development of Decision Support System," MIS Quarterly, pp. 1-26, Dec. 1980.
- [Stacey, 74]. G.M. Stacey, "The Interface Between a Database and its Host Language," in Klimbie and Koffemann (eds.), Data Base Management, pp. 305-315, 1974.
- [Waltz, et al, 77]. D.L. Waltz and B.A. Goodman, "Writing a Natural Language Data Base System," in 5th International Joint Conference on Artificial Intelligence-1977, MIT, pp. 144-50, 1977.
- [Wedekind, 74]. H. Wedekind, "On the Selection of Access Paths in a Data Base System," in Klimbie and Koffemann (eds.), Data Base Management, 1974.
- [Wiederhold, 83]. G. Wiederhold, Data Base Design (2nd ed.), N.Y.: McGraw-Hill, 1983.
- [Weizenbaum, 66]. J. Weizenbaum, "Eliza: A Computer Program for the Study of Natural Language Communication Between Man and Machine," CACM, Vol 9, No. 1, pp 36-45, 1966.
- [Winograd, 71]. T. Winograd, "Procedures as a Representation for Understanding Natural Language," MAC-TR-84. Cambridge, Mass.: MIT Project MAC. 1971.
- [Winston, 79]. P.H. Winston and R.W. Brown, "Artificial Intelligence: An MIT Perspective, vol. 1, Cambridge: MIT Press, 1979.

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[Woods, 73]. W.A. Woods, "Progress in Natural Language Understanding: An Application to LUNAR Geology," Proc. AFIPS 42, NCC, pp. 441-50. 1973.

[Zloof, 78]. M.M. Zloof, "Design Aspects of the Query-By-Example Data Base Management Language," in B. Shneidermann (ed.), Data Bases: Improving Usability and Responsiveness. London: Academic Press, pp. 29-53, 1978.

International Joint Conferences on Artificial Intelligence, 5th International Joint Conference on Artificial Intelligence-1977, vol. 1, Cambridge, Mass., 1977.

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ATTACHMENT 5.1

"AN OVERVIEW OF THE USL/DBMS NASA/PC
R&D PROJECT WORKING PAPER SERIES,"

WAYNE D. DOMINICK,

USL/DBMS NASA/PC R&D WORKING PAPER SERIES
REPORT NUMBER DBMS.NASA/PC R&D-1.

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The USL/DEMS NASA/PC R&D Working Paper Series contains a collection of formal and informal reports representing results of PC-based research and development activities being conducted by the Computer Science Department of the University of Southwestern Louisiana pursuant to the specifications of National Aeronautics and Space Administration Contract Number NASW-3846.

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AN OVERVIEW OF THE
USL / DBMS NASA / PC R&D PROJECT
WORKING PAPER SERIES

Wayne D. Dominick

The University of Southwestern Louisiana
Computer Science Department
Lafayette, Louisiana

Revised: August 15, 1984

AN OVERVIEW OF THE
USL / DEMS NASA / PC R&D PROJECT
WORKING PAPER SERIES

ABSTRACT

The USL/DEMS NASA/PC R&D Working Paper Series has been established to provide a mechanism for documenting the activities that are being performed by the University of Southwestern Louisiana pursuant to the specifications of National Aeronautics and Space Administration Contract Number NASW-3846.

The USL/DEMS NASA/PC R&D Project is addressing a wide variety of PC-based research and development areas oriented toward the effective utilization of microcomputers in support of casual user access to remote, mainframe-based, large-scale interactive information storage and retrieval systems.

This document represents an index into the entire USL/DEMS NASA/PC R&D Working Paper Series.

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Following is a table of contents of the USL/DEMS NASA/PC R&D Working Paper Series. Documents that are completed and are available for dissemination are listed in the first part of the table of contents. The second part of the table of contents represents an identification of the documents that are currently in progress. As these are completed, they will be incorporated into the Working Paper Series and hence will be available for dissemination.

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DOCUMENT NUMBER DOCUMENT AUTHOR(S) / TITLE / DATE / PAGINATION

DEMS.NASA/PC R&D-1 Dominick, Wayne D., "An Overview of the
USL/DEMS NASA/PC R&D Project Working Paper
Series," Revised August 15, 1984, 6p.

DEMS.NASA/PC R&D-2 Dominick, Wayne D., "The USL NASA PC R&D
Project: General Specifications of
Objectives," June 6, 1984, 6p.

DEMS.NASA/PC R&D-3 Moreau, Dennis R., "The USL NASA PC R&D
Development Environment Standards," July 31,
1984, 8p.

DEMS.NASA/PC R&D-4 Triantafyllopoulos, Spiros, "General
Specifications for the Development of a
PC-Based Simulator of the NASA RECON System,"
August 2, 1984, 21p.

DEMS.NASA/PC R&D-5 Bassari, Jinous and Triantafyllopoulos,
Spiros, "General Specifications for the
Development of a USL NASA PC R&D Statistical
Analysis Support Package," August 2, 1984,

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DEMS.NASA/PC R&D-6 Chum, Frank Y., "General Specifications for the Development of a USL NASA PC R&D Distributed Workstation," August 15, 1984, 10p.

DEMS.NASA/PC R&D-7 Moreau, Dennis R., "The USL NASA PC R&D Interactive Presentation Development System," August 2, 1984, 8p.

DEMS.NASA/PC R&D-8 Chum, Frank Y., Hall, Philip P., Moreau, Dennis R., and Triantafyllopoulos, Spiros, "The USL NASA PC R&D Project: Detailed Specifications of Objectives," August 15, 1984, 21p.

DEMS.NASA/PC R&D-9 Hall, Philip P., "Design Criteria for a PC-Based Common User Interface to Remote Information Systems," August 13, 1984, 21p.

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USL/DEMS NASA/PC R&D FUTURE WORKING PAPER SERIES INDEX

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ATTACHMENT 5.2

**"THE USL NASA PC R&D PROJECT:
GENERAL SPECIFICATIONS OF OBJECTIVES,"
WAYNE D. DOMINICK,
USL/DBMS NASA/PC R&D WORKING PAPER SERIES
REPORT NUMBER DBMS.NASA/PC R&D-2.**

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The USL/DEMS NASA/PC R&D Working Paper Series contains a collection of formal and informal reports representing results of PC-based research and development activities being conducted by the Computer Science Department of the University of Southwestern Louisiana pursuant to the specifications of National Aeronautics and Space Administration Contract Number NASW-3846.

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THE USL NASA PC R&D PROJECT:
GENERAL SPECIFICATIONS OF OBJECTIVES

Wayne D. Dominick

The University of Southwestern Louisiana
Computer Science Department
Lafayette, Louisiana

June 6, 1984

THE USL NASA PC R&D PROJECT:
GENERAL SPECIFICATIONS OF OBJECTIVES

ABSTRACT

This document represents a general and high-level identification of the initial set of objectives to be addressed within the scope of the USL NASA PC R&D Project.

Detailed specifications of objectives, tasking assignments, schedules, and implementation plans for each of the general objectives identified within this document will be addressed within future entries within this PC R&D Working Paper Series.

THE USL NASA PC R&D PROJECT:
GENERAL SPECIFICATIONS OF OBJECTIVES

(1) PC FUTURE FACILITIES PLANNING

- (a) Hardware acquisition recommendations.
- (b) Software acquisition recommendations.
- (c) Preparation of Purchase Requisitions after approval of acquisition recommendations.
- (d) Conduct of facilities planning process in light of currently severe budgetary constraints.

(2) PC USAGE ENVIRONMENT PREPARATION

- (a) Preparation of specifications for PC access control policies, i.e., policies controlling who is allowed usage access of the PC, what they are allowed to do, etc.
- (b) Preparation of specifications for PC usage training, i.e., development of training programs to be followed by individuals prior to PC usage, potentially including

training seminars, interactive demos, manuals or portions thereof to be reviewed, etc.

- (c) Preparation of system development standards for systems design, programming, testing, and documentation for use within a C programming environment on the PC's.
- (d) Preparation of specifications for backup/recovery procedures.

(3) PC R&D PLANNING: SPECIFICATIONS OF R&D OBJECTIVES

- (a) PC-based information system simulators and data base simulators.
- (b) PC-based user/system interfaces to remote information systems.
- (c) Definition of multi-system common command language and PC-based front-end common command language translators.
- (d) PC-based CAI training mechanisms for remote information systems.

(e) PC-based scientist's/engineer's R&D workstation:

(e1) Standalone workstation functionality.

(e2) Distributed/networked workstation functionailty.

(e3) Distributed / networked workstation
intercommunication and uploading/downloading
protocols (between workstations; between
workstation and remote mainframes).

(f) PC-based graphics.

(g) Loaner IBM PC XT/370: what would we do with it? why
would we do this? how would we like it configured?
when do we need it? for how long?

(h) PC-based workbench to support the current NASA contract
work environment, including what workbench facilities
should be implemented at the PC level, what workbench
facilities should remain at the Multics level, and how
the PC workbench should communicate with the Multics
workbench.

(i) PC-based support for knowledge-based systems.

(j) PC-based support for information system performance
measurement and evaluation.

(4) PC R&D PLANNING: IMPLEMENTATION OF R&D OBJECTIVES

Preparation of an implementation plan for each item listed in section (3) above. For internal projects, e.g., the PC workbench, the implementation plan should presume existing staffing, no extra budget, etc. For external projects, i.e., any project that may be of interest to an external funding agency, the implementation plan should have as its deliverable a contract proposal (e.g., PC simulator proposal, IBM equipment acquisition proposal, etc.). In either case, the implementation plan should specify tasking assignments (who will be responsible for what parts of the implementation) and a schedule (milestone date for each part of the implementation).

ATTACHMENT 5.3

**"THE USL NASA PC R&D
DEVELOPMENT ENVIRONMENT STANDARDS,"
DENNIS R. MOREAU,
USL/DBMS NASA/PC R&D WORKING PAPER SERIES
REPORT NUMBER DBMS.NASA/PC R&D-3.**

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The USL/DEMS NASA/PC R&D Working Paper Series contains a collection of formal and informal reports representing results of PC-based research and development activities being conducted by the Computer Science Department of the University of Southwestern Louisiana pursuant to the specifications of National Aeronautics and Space Administration Contract Number NASW-3846.

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THE USL NASA PC R&D
DEVELOPMENT ENVIRONMENT STANDARDS

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July 31, 1984

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WORKING PAPER SERIES

The USL NASA PC R&D
DEVELOPMENT ENVIRONMENT STANDARDS

ABSTRACT

To facilitate the development of PC based projects, it is necessary to establish a set of operating standards. The intent of these procedures is to prevent unintentional interference between projects being concurrently developed on the PCs.

The standards address the following areas :

- Scheduling PC resources
- Login/Logout Procedures
- Training
- File Naming Conventions
- Hard Disk Organization
- Diskette Care
- Backup Procedures
- Copying Policy

Programming standards will be addressed in separate 'PC Programming Standards' documents.

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IV.	FILE NAMING CONVENTIONS	5
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VII.	BACKUP PROCEDURES	8
VIII.	COPING POLICY	8

I. SCHEDULING PC RESOURCES

In order to assure a rational allocation of PC resources, a project proposal must be submitted to, evaluated by, and scheduled by the PC-R&D Team before any pc-based development work is initiated. The proposal should contain an estimate of PC time, PC storage, and system software required. The evaluation process will assign a priority to the project and schedule (or not schedule) it accordingly. A schedule sheet will be posted, containing the current PC time reservations. Any unreserved time slots can be used for training and experimentation.

II. LOGIN/LOGOUT

Once a project is scheduled, all development should be done while logged in under that project. The login/logout procedures are intended only to allow some measurement of PC resource utilization. Each scheduled project will be assigned a project name to be used for relevant development; work not pertinent to a scheduled project should be performed under the train project.

III. TRAINING

Training materials will be made available for all system software in terms of users manuals, commented working examples, online help, and, in some cases, online tutorials. As training material becomes available, notices will be distributed via Multics mail and through demonstration sessions. Questions may be placed in the PC Black Box; questions and answers will be posted.

IV. NAMING CONVENTIONS

PC DOS 2.1 allows eight character file names with three letter extensions. To allow consistent and efficient use of wild card file specifications, the following naming conventions should be adhered to:

1) The first eight characters positions should contain only the characters: {'a'..'z','A'..'Z','1'..'9','-' } and should comprise a meaningful name.

2) Extensions should indicate file type or format. The recommend extensions are:

HLP	-	Help files
SYS	-	System log files
PAS	-	PASCAL source files
BAS	-	BASIC source files (compressed and ascii)
C	-	C source files
RF	-	Files in the Multics runoff format

WX - Files in the Wordix format
RO - Runoff output
WO - Wordix output
OBJ - Unlinked intermediate object code
EXE - Executable machine code
COM - Executable machine code (quick load format)
BAT - ASCII files containing DOS commands
ASM - Assembler source code
LIB - Library files (contain multiple OBJs)
DVC - Printer device drivers

V. HARD DISK ORGANIZATION

PC DOS 2.1 supports a hierarchical file system which is a valuable storage management feature. The following structure policy has been adopted:

- 1) The ROOT directory (\) will contain only other directory entries and system startup batch files.
- 2) Each registered user will have an individual directory under work not appropriate to project directories.&D for
- 3) The COM directory will be used for uploading and downloading files. Once the accuracy of the file is established, it should be immediately copied out of the COM directory to the appropriate area and deleted.
- 4) Because access to overlays, libraries, and error files is necessary for most compilers, all compilations should be done in the appropriate language files removed before users logoff.

5) For each project, an operational and a developmental directory will be established. Code will be migrated from the developmental to the operational directory only after it has met pre-defined debugging criteria (see C Programming Standards)

6) The \DOS directory contains system support files. No files should be added to this directory.

7) All major software systems will be located in dedicated directories to facilitate installation and backup. (e.g., \DBASE2, QMM, \WP\EDIX, etc.)

VI. DISKETTE CARE

Floppy diskettes, because they are exposed directly to environmental conditions, require a certain degree of care to maintain their integrity. The following guidelines should prevent any difficulties:

1) Keep diskettes in jackets until they are inserted into the disk drive.

2) If diskettes must be carried out of the lab, keep them in a rigid sealed container. Keep diskettes away from heat and moisture.

3) Never bend diskettes or touch the mylar surface. Should a diskette become contaminated, do not insert it into the

diskette drive. To do so would cause contamination of disk drive heads.

4) Never write on diskettes with a ballpoint pen; use felt tip markers only.

5) Always label diskettes, regarding contents and write protect critical diskettes by covering the write protect notch with a write protect tab.

VII. BACKUP PROCEDURES

Project directories will be backed up, via the backup command, by system personnel at 5pm on Fridays. Users will be responsible for backing up any significant changes in the interim. All backup diskettes should be clearly labeled, showing date of backup, directory path, contents, and sequence number, for multi-diskette backups.

VIII. COPYING POLICY

Purchased software may be copied, for backup purposes, exclusively by system personnel. Users may not, for any reason, copy software purchased for use on the PC/XTs. Illegal distribution of software jeopardizes not only the individuals involved, but the University and the project as a whole.

ATTACHMENT 5.4

**"GENERAL SPECIFICATIONS FOR
THE DEVELOPMENT OF A PC-BASED
SIMULATOR OF THE NASA RECON SYSTEM,"
SPIROS TRIANTAFYLLOPOULOS,
USL/DBMS NASA/PC R&D WORKING PAPER SERIES
REPORT NUMBER DBMS.NASA/PC R&D-4.**

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The USL/DEMS NASA/PC R&D Working Paper Series contains a collection of formal and informal reports representing results of PC-based research and development activities being conducted by the Computer Science Department of the University of Southwestern Louisiana pursuant to the specifications of National Aeronautics and Space Administration Contract Number NASW-3846.

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GENERAL SPECIFICATIONS
FOR THE DEVELOPMENT OF
A PC-BASED SIMULATOR OF THE NASA RECON SYSTEM

Spiros Triantafyllopoulos

The University of Southwestern Louisiana
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August 2, 1984

GENERAL SPECIFICATIONS
FOR THE DEVELOPMENT OF
A PC-BASED SIMULATOR OF THE NASA RECON SYSTEM

ABSTRACT

This document will describe the general specifications for a NASA/RECON simulator targeted for a Personal Computer. Information system simulation provides several advantages during system training, since it allows extensive use of the system without the typically high cost overhead of accessing large-scale, remote systems and also can provide a better user interface and assistance. This means less cost for the end-user, faster and more efficient training, all resulting in increased user productivity.

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GENERAL SPECIFICATIONS .
FOR THE DEVELOPMENT OF
A PC-BASED SIMULATOR FOR THE NASA RECON SYSTEM

This is a working document. If you have any comments please contact the PC Simulator R&D team. Versions of this document will be circulated on a regular basis until finalization. The design and implementation of the simulator will require many changes suggested by individual reviewers; your feedback will be appreciated.

I. INTRODUCTION

This document will define the specifications for the IBM PC/XT-based NASA/RECON System Simulator. Input to this document has been from the USL NASA Contract Team and, up to this point, not from the NASA/RECON designers.

An information system simulator is defined as a program that behaves like a certain information system. The purpose of such a simulation is multiple: prototyping, CAI, reducing online costs, etc. In the NASA/RECON simulator, the main motive has been the development of a simulator as an educational tool to allow

instruction without paying the high (\$50.00/hour or more) cost of long distance telephone charges, TELENET charges, and online host system charges. Also, CAI could be embedded in the implementation so that teaching a potential user can be highly automated and thus simplified.

In simulating an information system as large and as powerful as the NASA/RECON system, it should be of top priority to decide very early on the features that should be included as well as the features to be excluded, if any. The original NASA/RECON system is written in PL/IG and runs on an IBM 4341 computer (NASA/RECON Users Manual). Trying to simulate it on an IBM PC/XT would need very careful planning concerning what is to be included and what is to be excluded.

In such cases, where a program has to be migrated or simulated from one computer to another, it is obvious that the techniques applied in the original implementation may not be applicable to implement the model. In the following pages, some details will be highlighted.

II. GENERAL FILE DESIGN

The NASA/RECON system is a bibliographical Information Storage and Retrieval System. The system is based on a thesaurus, a list of words and related terms on which searches can be made. The thesaurus is the main part as it provides a basis for subsequent indexing of entries according to standard conventions and terms. In reality, the NASA/RECON thesaurus contains several thousand entries and approximately 2 million records in all file collections. It is obvious that the PC-based simulator can not contain more than a fraction of these records. Still, the thesaurus is needed as it is the main facility for indexing and retrieving documents and the PC-based thesaurus should be of a reasonable size to support simulating, if not replicating reality.

Record design should follow the NASA/RECON standard, with fields for the following items (as a minimum/first requirement):

<ul style="list-style-type: none">* ACC: accession numberFST: financial support typeISS: issue numberJAP: page numbers* CAT: subject category* RN: report number* CN: contract number* PDI: publication datePAG: number of pagesLNG: document language* UTI: unclassified title* TLS: title supplement* AU: personal author* PAA: personal author affiliate* CO: corporate source* PUB: publisher	<p>Note: in all entries, "*" denotes a directly searchable term which is indexed (keyed).</p>
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In addition, the following items must be included for text searches in the data base:

- * MJS: major terms
- * MNR: minor terms both form ST (subject terms)
- ABS: abstract
- SUM: summary
- * ANI: analytical terms
- * ANN: analytical notes

Other terms and fields can be added as needed, if implementation constraints allow such expansions. However, file design depends on the file management system to be used.

File structures like the above would need disk space on the order of 1300-1500 characters per record so that all items are searchable, excluding keys. The file system to be acquired will support the Indexed Sequential Access Method (ISAM), based on multiple user-defined keys. Thus, an inverted file structure will be used, with all searchable items keyed, together with a record number to identify the entire record. If the number of records is kept small, then we can use sequential searches as well to avoid multiple indices and the associated space requirements as well.

On double sided, double density diskettes, up to 150 records can be included. A second diskette will contain the program, ISAM file management, user stored queries, scratch files and other supporting software. The thesaurus and dictionary/support files

will be included in the data disk. Thus, a two-disk based approach is necessary if simulation is to be realistic. Program size should be around 128 to 256 Kbytes, possibly by chaining some parts of the program on and off the program disk. Program data size has to be limited if effective use of the system and compatibility with others are desired.

An estimation of the disk space requirements (tentative) is as follows:

240K: data base (150 records x 1600 bytes/record)
45K : index lists (150 records x 15 items x 20 bytes/item)
40K : Thesaurus ((20 bytes/term + 20 ptrs) x 1000 terms)
16K : Linking (see next page)
24K : Free (workspace, etc.)

365K: Total disk space, double-sided, double-density

A brief explanation on the storage allocation estimates follows:

- a. Data Base: The average NASA/RECON record fits in approximately one screen of a Cathod-Ray Terminal, which is 24 x 80. By limiting line length to approximately 60, as RECON does, we arrive at a length of 1600 bytes/record

approximately as an average.

- b. Index lists: Assuming an indexed sequential file, then with 15 searchable indexed terms, allocating 20 bytes/record (this would be 17-18 for the term and 1-2 for the record number) makes a total of 45K. This depends on the characteristics of the ISAM file management package to be used; however, other similar packages have approximately the same space requirements.
- c. Thesaurus: Assuming a maximum number of 1000 entries, including 20 pointers (max) for each term, 4 each to narrower, broader, related and used for, and 20 more bytes for the term and the associated record number, we need 40 bytes/record for a total of 40K bytes.
- d. Linking list: Used for the thesaurus, it is an inverted list of thesaurus terms and record numbers, indexed on record numbers. This facilitates thesaurus cross-references and minimizes disk references. The space needed is 20 bytes/record for 1000 records giving a total of 20K bytes.
- e. Free: This area can be used for any purpose that might arise, but as read-only. Temporary areas will reside on the program disk. This area will also cover unexpected changes in the design or other changes dictated by the design/implementation

cycle.

The design of the data file structures was mainly influenced by the need for fast access to data. Regular inverted file structure is not adequate in the case that the entire record needs to be displayed. Thus, in order to increase speed of access, the lists and the records themselves carry the information redundantly.

As it stands, the original design does not include any Computer Aided Instruction improvements, with the exception of more specific error messages. If CAI is to be incorporated, then one more disk would be required for the CAI material.

III. NASA/RECON COMMAND LANGUAGE

The NASA/RECON system features a quite simple instruction format. Abbreviations for the commands can be used. All parameters follow the command after either a space or a slash ("/"). Some commands, while they are functional on NASA/RECON, will be reproduced in the simulator just for "simulation" purposes without doing anything functional. Others will perform tasks parallel to the corresponding mainframe NASA/RECON.

A list of no-operation commands and their corresponding actions follows:

BEGIN starts a search session; the user is asked to select a file collection and is placed in the RECON search environment. Then the RECON message is printed and the user commences the search. BEGIN can also function as a restart function to allow clean-up of previous searches and terminate current session, although END SEARCH should be used instead.

CANCEL will print a message but will not cancel a queued-up query, since there is only one user.

COMMAND STATUS will also function like CANCEL since no queing-up

of queries is permitted.

END SEARCH will terminate the current search session and display data relevant to the search, and ask the user some information.

END SEARCH BYPASS will terminate the session like END SEARCH but will not present the questionnaire.

HELP will provide some help to the user. The original NASA/RECON text can be used, or more explanatory text.

NEWS will display a login-like message, similar to RECON's.

ORDER will display a message similar to the one displayed when a document is ordered.

PAGE can count the number of lines and stop every 23 or so, and wait for response. It can be difficult to implement without the extra overhead.

PRINT will function like the ORDER, informing the user of his/her command. Again, output should be similar to NASA/RECON output.

SIGNOFF will terminate the session immediately, and return the user to operating system level in contrast with END SEARCH and END SEARCH BYPASS which leave the user in the simulator.

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SIGNON will be used to start a user session and allow the user to enter into the RECON system simulator. The user has to enter USERID.

CURRENT will print all information about a user session, and let the user continue his/her session.

BEGIN BYPASS will start a search session without asking for user data.

NASA/RECON functional commands that are executed and interact with the database are as follows:

EXPAND will expand a term from the system dictionary. In practice, the word will be looked up and all terms that have similar spellings are printed along with the numbers of occurrences, like the real RECON system. This can be performed by storing words (terms) and occurrences in the same file, indexed by term in ascending order.

SELECT will select a set displayed by the EXPAND instruction. Linked lists can be used with a storage pool where the sets are represented by numbers (keys). When a set is to be displayed or otherwise manipulated, the linked list will recall the numbers (keys) and the ISAM will read in the

appropriate sets. Fields will be user specified.

The SELECT command has various forms:

TEXT search can be performed on user-specified words and phrases. Sequential searches will be performed unless the terms requested are indexed. Sequential searches will be performed in the case of abstracts, to avoid excessive storage for files.

RANGE search can be performed by using upper and lower values in the indexes that the terms are sorted upon. This can be performed by reading directly the lower bound and from then sequentially until the upper bound. Open-ended searches can also be supported in a similar manner.

ROOT search will have to be performed sequentially from the first record in the range until the last one in the range. It does not seem to present major difficulties.

COMBINE will do the basic Boolean manipulation functions (AND, OR, NOT) plus combinations. For the simulator, a set expression interpreter will be required to perform these three operations on sets: AND is Intersection, OR is Union, NOT is set difference.

DISPLAY will display user-selected sets. The only complexity involved is user-defined formats. The standard specified formats can be used, allowing limited user-defined formats from a pre-defined subset.

FREQUENCY will definitely be complex enough to be placed in a deferred priority list. It can be implemented by keeping track of all MAJ and MIN terms, sorting the resulting list for a given set and producing frequencies of the resulting array (or file). The problem will be the time required to execute this instruction.

KEEP will just make a copy of the set requested, in the temporary set 99. It does not seem difficult, but depends on the complexity of the list manager.

LIMIT will remove items from the user specified set based on user specifications. It involves little more than set item deletion. LIMIT ALL will do this for all sets in the current process. LIMIT RELEASE will restore the sets into their previous state. File dumping every time a LIMIT is issued seems to be a reasonable implementation method. When a LIMIT RELEASE is issued, sets are reloaded from the user file(s) in the original condition. Space considerations should be addressed since keeping lists in file(s) would take up fair

amounts of storage.

SORT will sort a given set based on a user-defined key. The time required for execution can be a problem but otherwise it can be implemented with no major difficulties. Sort can be performed on certain keys only, in which case the program can be quite simple.

SEARCH will combine selection expressions. A reasonable way of implementing it would be to pass the appropriate arguments to the EXPAND, SELECT and COMBINE routines (provided that they are set up for such tasks) and then finally come up with one set. Again time required for execution will be the only major problem to be identified. A minor detail would be NASA/RECON's special requirements for blanks, stars ("*") and quotes, since the allowable characters are not common among terms searched.

SPECIFY FORMAT will allow the user to change the default format(s) used. It will relate to the DISPLAY and TYPE commands, since it will redefine output formats. A way of choosing different formats can be found easily since "C" allows formats to be formed at run time, and control characters (new-lines, line-feeds, and various format specifications). This can be quite complex, however if many items must be displayed. RECON

provides some standard formats (like /4, /2, etc) that can be used to start with and then allow user-defined formats later on.

TYPE will display on the screen just a certain subset of the entire record for the set specified. TYPE can be handled if the SPECIFY FORMAT provides for the formats allowed (in TYPE). Thus, a call to TYPE can be made as a call to SPECIFY FORMAT to set the format, a call to DISPLAY and a call to SPECIFY FORMAT again to restore the original format.

RELEASE will re-initiate the set node pool and will also erase any file(s) created by LIMIT commands. It should be used with all the search initiation and termination procedures and commands to ensure proper initialization.

IV. PROGRAM DESIGN ISSUES

The language that will be used for the implementation of the NASA/RECON simulator on the IBM PC/XT will be "C". In addition, an Indexed Sequential Access Method (ISAM) file management system will have to be obtained, since "C" does not provide for such support.

The file management system will be used for the support of all the inverted files to be maintained. Since all non-free-text searchable terms will be stored in inverted files, file design should be very carefull to avoid disk space overflow. The file management system comes in source code and the rights (licence) for the incorporation of it in user software. So the file management object code should also go on the simulator diskette.

System portability will have to be considered not only at the PC level but at the mini and mainframe level as well. The "C" compiler to be used is compatible with Unix (R) version 7 "C". Tests are being performed to determine the compatability between the PC/XT "C" and the "C" available on the VAX/VMS system. The primary goal is, of course, the PC/XT simulator, but the popularity of both Unix (R) and VAX/VMS can be a major factor if a production version of the simulator is made.

Stored queries will be a special issue to be considered. Most of the programs that are needed to support a stored query system are the same as the ones needed for the interactive interface. The query editor is not complicated and can be easily implemented.

Stored queries are advanced features which are not likely to be used by inexperienced simulator users. To provide, however, for a realistic environment that fully replicates RECON, and allows experienced users to practice more with the system, the stored search features must be implemented. Individual user groups should be allowed space on the data disk for their stored searches, and in general the whole stored search environment will be replicated. The problem with stored searches is that the entire user interface (RECON command level) will have to be tailored in batch/interactive environment. Such a command level would allow inputs from both file and terminal, and be able to store and edit queries as required. Again, complexity and efficiency are the main factors, but the result will be a much better simulation of the RECON system.

System logging in can be performed in a variety of ways: just enter RECON command level and BEGIN SEARCH, or simulate all the TELENET/NASA Host login procedures (!) for a more "realistic" environment. The same is also true for quitting the system and returning to operating system level.

Error recovery is also a major item to be considered. In case of error, NASA/RECON displays a cryptic message and nothing else, expecting the user to have a manual and see the error from the error code. This is definitely not going to help the users of the simulator. The proposed design can have two levels: a beginning level where all messages are self-explanatory with examples etc, and an advanced level where the same message structure as the RECON system is followed. Some messages can be extremely confusing (even to M.Sc. CMPS Students) and the help facility does not do much to explain. The help text can again be arranged in two levels as well. Then, the user can be asked if he wants the beginner or advanced level and proceed with the system.

User monitoring can help improve the simulator (and the NASA/RECON system as well). A facility similar to MADAM's can be incorporated. The number of queries, errors, and other measurable items can be recorded and used for both simulator and user evaluation. After a session the user can see his/her performance and improve based on the results. System evaluation can also be performed in a similar fashion. This is feasible on hard-disk based PC/XT's only as the additional space needed for Performance Measurement and Evaluation can be fairly large. Hardware monitoring functions will be rather difficult (and useless) to incorporate, since the simulator is only a model. User monitoring

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is, however, much more important.

The data base will be populated mainly from records downloaded from the NASA/RECON system. The thesaurus, however, can not be downloaded and mainly depends on the records downloaded. If this is not possible, then MADAM records can be easily downloaded and used. Again a thesaurus and dictionary will have to be formulated and this can be a major task.

ATTACHMENT 5.5

**"GENERAL SPECIFICATIONS FOR
THE DEVELOPMENT OF A USL NASA PC R&D
STATISTICAL ANALYSIS SUPPORT PACKAGE,"
JINOUS BASSARI AND SPIROS TRIANTAFYLLOPOULOS,
USL/DBMS NASA/PC R&D WORKING PAPER SERIES
REPORT NUMBER DBMS.NASA/PC R&D-5.**

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The USL/DBMS NASA/PC R&D Working Paper Series contains a collection of formal and informal reports representing results of PC-based research and development activities being conducted by the Computer Science Department of the University of Southwestern Louisiana pursuant to the specifications of National Aeronautics and Space Administration Contract Number NASW-3846.

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DBMS.NASA/PC R&D-5

WORKING PAPER SERIES

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GENERAL SPECIFICATIONS
FOR THE DEVELOPMENT
OF A USL NASA PC R&D
STATISTICAL ANALYSIS SUPPORT PACKAGE

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August 2, 1984

GENERAL SPECIFICATIONS
FOR THE DEVELOPMENT
OF A USL NASA PC R&D
STATISTICAL ANALYSIS SUPPORT PACKAGE

ABSTRACT

This is a three-level package designed to allow statistical analysis for a variety of applications within the USL DEMS NASA/RECON project. Designed with flexibility and uniformity as the main considerations, it is expected to provide computational capabilities for a variety of user needs, beginner to expert, in three different forms: a library package, an interactive package and a batch-processing package.

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GENERAL SPECIFICATIONS
FOR THE DEVELOPMENT
OF A USL NASA PC R&D
STATISTICAL ANALYSIS SUPPORT PACKAGE

I. INTRODUCTION

This is a proposal for the design, development and implementation of a general-purpose statistical package for the USL DBMS NASA/RECON project.

Statistical Packages offer to the user the power and flexibility they need, without having to write complicated programs. In addition, the user can be assured of the accuracy of the results. Many statistical packages have been developed so far, for all types and sizes of computers.

There are three major types of statistical packages available for the user:

i. Statistical Program Libraries.

Statistical Libraries are collections of programs that are bound together in one collection. The user can call them from his/her application programs, supplying the appropriate arguments and obtaining the results in a similar way.

ii. Interactive Statistical Packages.

Interactive Statistical Packages allow the user to interact with the computer. The user is put on at a "command level", where he/she issues commands and enters data. The program processes the data and returns the results to the user on the terminal screen.

iii. Batch Statistical Programs.

Batch programs allow the user to collect all his/her commands to the program in one group, code them in a particular language, and then process the entire batch. The user does not interact with the execution at all.

This research and development proposal intends to implement all three packages under a unified interface. The result is expected to be a flexible and powerful package with common characteristics between its three forms. It is also intended to be completely transportable among any computer that can support the "C" programming language. This includes 3 of the 4 large computer systems available at USL, namely the DEC UNIX VAX-11/780, DEC VMS VAX-11/780, the Pyramid Technologies 90x, and, of course, the IBM PC/XT.

II. OBJECTIVES OF THE PROJECT

The generic objectives of the project are as follows:

- i. To develop a powerful, flexible, easy-to-use and transportable statistical package.
- ii. To improve our knowledge in the fields of statistics and numerical computation.
- iii. To obtain further experience on the design, implementation, testing and maintenance of a major software product.

The specific objectives of the statistical package design are as follows:

- i. Computational power: the objective is a design that can satisfy most user needs in terms of available functions and options. The package should offer a full range of commands for most applied statistical computations.
- ii. Design flexibility: The design must be flexible so that changes, improvements and addition of more functions can be accommodated without major changes, if any, to the entire package.
- iii. Ease of use: the design should be such that any of the three interfaces will be easy to use efficiently. This includes

error checking and, in the case of the interactive user interfaces, available online help. Uniform command and function formats in all three modes will be used also.

- iv. Efficiency and accuracy: Efficiency of the algorithms used is very important considering that the package to be developed will be used in mini and micro computers with often limited resources and speed of execution problems. Accuracy is also critical so that the user is assured of the quality of the results.
- v. Package Transportability: The programs should be written in a way that ensures transportability between varying operating environments. Standard programming policy will be adopted for all modules.

This design will be first implemented on the IBM Personal Computers of the NASA/RECON Project. Parallel development on the DEC VAX-11/780 will also be considered.

III. METHODOLOGY

A highly modular approach will be followed in the design and implementation of this project. This will ensure that many of the design objectives, in particular, flexibility and modifiability, are inherent in the implementation.

For achieving the transportability and modularity goals, the "C" programming language was chosen as the implementation language. It offers good performance characteristics and high modularity which make it most desirable. It is also powerful in character and file manipulation, facts that make it more desirable to use in the second and third phase of the design.

Algorithm selection is critical in the computational parts. Therefore, extensive research will have to be performed in order to determine the most appropriate ones to be used. While a computer approach to manual algorithms can be used, for some cases it is not efficient and better methods should be found.

At this point only the first phase of the statistical package has been totally defined. The interactive and batch interfaces will be designed under the considerations applied to the first phase, with the final goal being to create a common, efficient interface for all three modes. A defined command

language for the interactive phase would consist of either a menu-selection procedure, a command language or a combination. Again, the batch interface can be similar to the interactive in terms of command names, arguments, etc, or be a completely different programming language by itself.

For the interactive interface, a spreadsheet configuration like MINITAB is likely to be implemented, with its commands, arguments and options combined to form the batch programming language. Therefore, by making the library interface with a similar structure, the goal of uniformity can be achieved.

As a minimum, the functions shown below are expected to be implemented for the first phase (program library). Then the interactive and batch interfaces can be built on top of the packages. The modularity of the design will allow the addition of new functions and/or the modification of existing ones to be performed efficiently, with no major code changes in the entire program structure.

PROPOSED CONFIGURATION
OF PHASE 1

1. Basic Input/Output

Read from a given file
Read from terminal
Write to a given file
Write to terminal
Report error/warning messages

2. Basic One-Vector Calculations

SumX, SumX2, sum2X
Mean, mode, median
Variance, standard deviation
Sort ascending, descending, rank
Frequency, most/least frequent
Relative frequencies, signs
Max-min, local max/min, k-th max/min

3. One-Vector Test Statistics

Confidence intervals
z-scores, z-tests
Proportion tests
Student's t-test

Small/large sample sizes

4. Basic one-Vector Graphs

Bar Charts - Histograms

Frequency graphs

5. Two-Way Statistics

Hypothesis testing

Difference of means

Variance known/unknown

D-test

Paired Samples Tests

Tests for Standard Deviation

Degrees of Freedom, F-test

Tests for proportions

6. Two-Vector Graphics

Plots

Scatter Grams

Frequency Plots

Charts

X-Y plots

Distributions

7. Linear Regression and Correlation

Linear Regression Analysis

Regression Line calculations

Correlation Analysis

Standard Error

8. Multiple Regression

Exponential regression analysis

Logarithmic regression analysis

Parabolic regression analysis

Multiple Analysis

9. Basic Probability Calculations

Probability distributions

Normal distribution

Binomial distribution

Poisson distribution

Probability tests

p-test Probability confidence intervals

10. Advanced Probability Calculations

Conditional Probabilities

Independent Probabilities

Probability Estimations

Bayes' Theorem

Basic Combinatoric Calculations

$P(m,n)$ value

$C(m,n)$ value

$n!$ value

Probability distributions of samples

11. Chi Square Analysis

Contingency Tables

Chi Square tests

Chi Square distribution

Lambda Index of association

.12. Analysis of Variance

One-way analysis

Two-way analysis

Difference of several means

Total Variance calculations

13. Non-Parametric Tests

Sign test

Mann-Whitney test

Non-parametric ANOVA

IV. SUMMARY

Design, implementation, testing and maintenance of this major software package is expected to generate a support environment for any other activities that require statistical analysis within the NASA/RECON or related DEMS projects. The applicability of statistical analysis methods in information storage and retrieval systems is increasing, ranging from performance measurement and evaluation to natural language text analysis, thus making this project an interesting consideration for further research and development.

The unified environment that this document proposes is expected to further improve the user/system interface and make it more effective. Portability is also provided in order to have a single data analysis environment for more than one hardware configuration.

ATTACHMENT 5.6

**"GENERAL SPECIFICATIONS FOR
THE DEVELOPMENT OF A USL NASA PC R&D
DISTRIBUTED WORKSTATION,"**

**FRANK Y. CHUM,
USL/DBMS NASA/PC R&D WORKING PAPER SERIES
REPORT NUMBER DBMS.NASA/PC R&D-6.**

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WORKING PAPER SERIES

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GENERAL SPECIFICATIONS FOR THE DEVELOPMENT
OF A
USL/DEMS NASA/PC R&D DISTRIBUTED WORKSTATION

Frank Y. Chum

The University of Southwestern Louisiana
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Lafayette, Louisiana

August 15, 1984

GENERAL SPECIFICATIONS FOR THE DEVELOPMENT
OF A
USL NASA PC R&D DISTRIBUTED WORKSTATION

ABSTRACT

This document defines the general specifications for the development of a PC-Based distributed workstation (PCDWS) for an information storage and retrieval systems environment. This research proposes the development of a PCDWS prototype as part of the USL/DEMS NASA/PC R&D project in the PC-Based workstation environment.

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GENERAL SPECIFICATIONS FOR THE DEVELOPMENT
OF A
USL NASA PC R&D DISTRIBUTED WORKSTATION

I. INTRODUCTION

This document defines the general specifications for the development of a PC-based distributed workstation for the information storage and retrieval systems environment associated with NASA Contract Number NASW-3846.

With the advent of Large Scale Integration and Very Large Scale Integration (LSI/VLSI) technologies, microcomputers have become more and more powerful and cost-effective. Databases residing on them also become widely available. The trend of personal computers (PCs) serving as workstations provide the capabilities for having users become more effective in their utilization of a wide variety of machines in performing a large variety of functions local to the users. With the proliferation of personal computer hardware/software and telecommunication technology, we believe that the need for research and development of PC-based distributed workstation environments for information

storage and retrieval systems is extremely viable.

Our main goal is to develop a distributed workstation environment for scientists and engineers to assist them with day-to-day problem solving tasks as well as for accessing remote and/or local information systems. We propose to develop a comprehensive set of tools as functional components for the prototyping of a robust distributed workstation in an information storage and retrieval environment.

II. GENERAL AND SPECIFIC R&D OBJECTIVES

The general and specific research and development objectives of this research are summarized in the following sub-sections.

2.1 General Goals and Objectives

1. Provide a mechanism for very wide distribution of the information storage and retrieval capabilities of the NASA/RECON system.
2. Provide the potential performance improvement of performing selected functions local to the users.

3. Provide simulated information storage and retrieval system environments.
4. Provide state-of-the-art technology available to the NASA/RECON system.

2.2 Specific R&D Objectives

1. Provide a robust personal computer workstation environment with a comprehensive set of tools as functional components to serve as a scientist's / engineer's R&D workbench.
2. Provide access to multiple DBMS and/or IS&R systems.
3. Provide distributed/networked workstation intercommunication and uploading/downloading protocols between workstations and remote mainframes as well as between workstations.

III. RESEARCH & DEVELOPMENT METHODOLOGY

The research and development will be performed in three phases, namely, the specifications phase, design and implementation phase, and deployment phase. Various stages of each phase are summarized below. Figure 1 illustrates the interactions of the stages within the three phases.

3.1 Phase I : Specifications

1. User Requirement Analysis
2. NASA/RECON Requirement Analysis
3. Distributed Workstation Functional Specifications
4. Evaluation of Candidate Workstation Systems
5. Selection of Candidate Systems
6. Model System and Network Architecture

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2. System Implementation

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4. Prototyping of Finished System

3.3 Phase III: Deployment

1. Development Deployment and Support Strategies

2. Operational Maintenance and Enhancement

3. Performance Measurement and Evaluation

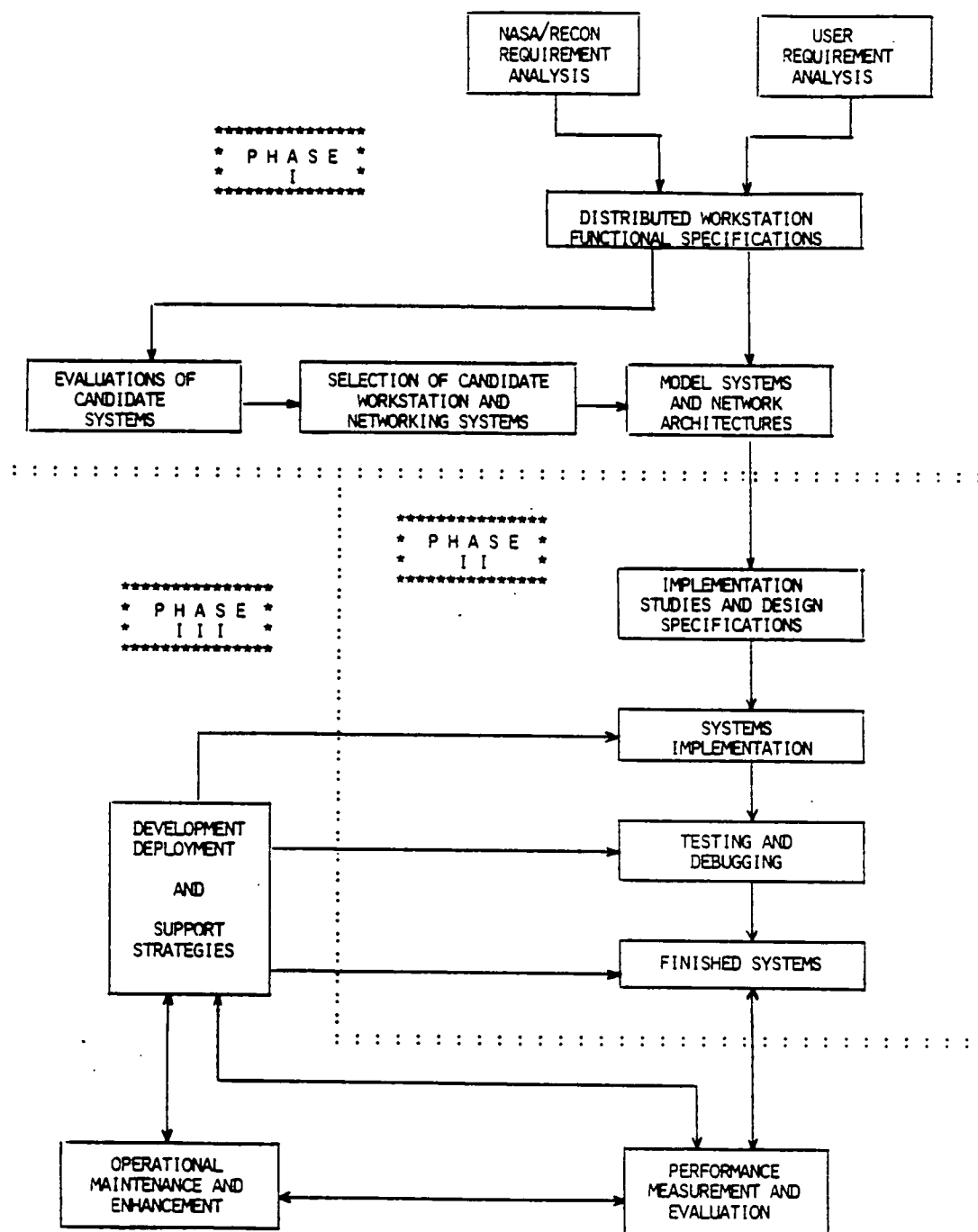


FIGURE 1. RESEARCH AND DEVELOPMENT PHASES AND THEIR INTERACTIONS

IV. SUMMARY AND CONCLUSION

This document describes general specifications for the development of a PC-based distributed workstation in the information storage and retrieval environment. General and selected specific research and development objectives are specified and a methodology is briefly overviewed for the prototyping of a such system.

We believe that this research will be extremely significant within both current and future information system oriented R&D workstation environments.

ATTACHMENT 5.7

**"THE USL NASA PC R&D INTERACTIVE
PRESENTATION DEVELOPMENT SYSTEM,"**

DENNIS R. MOREAU,

USL/DBMS NASA/PC R&D WORKING PAPER SERIES

REPORT NUMBER DBMS.NASA/PC R&D-7.

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The USL/DEMS NASA/PC R&D Working Paper Series contains a collection of formal and informal reports representing results of PC-based research and development activities being conducted by the Computer Science Department of the University of Southwestern Louisiana pursuant to the specifications of National Aeronautics and Space Administration Contract Number NASW-3846.

For more information, contact:

Wayne D. Dominick

Editor
 USL/DEMS NASA/PC R&D Working Paper Series
 Computer Science Department
 University of Southwestern Louisiana
 P. O. Box 44330
 Lafayette, Louisiana 70504
 (318) 231-6308

DEMS.NASA/PC R&D-7

WORKING PAPER SERIES

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THE USL NASA PC R&D
INTERACTIVE PRESENTATION DEVELOPMENT SYSTEM

Dennis R. Moreau

The University of Southwestern Louisiana
Computer Science Department
Lafayette, Louisiana

August 2, 1984

DEMS.NASA/PC R&D-7

- 1 -

WORKING PAPER SERIES

The USL NASA PC R&D
INTERACTIVE PRESENTATION DEVELOPMENT SYSTEM

ABSTRACT

IPDS is a very interactive system for creating, editing, and displaying video presentation sequences. It is designed for users with little or no computer experience, and can be used effectively with just a few minutes practice.

Users interact with IPDS through the keyboard, creating text with normal keys and invoking special functions with <alt> combinations and function keys. Once a particular screen is created it can be stored into a screen file for subsequent retrieval .

Script files may be created, containing a list of screen file names to be used in a presentation sequence. Users can step through the sequence forward or backward, focusing attention to areas of the screen with special cursor pointers. Screens may be dynamically modified during the presentation to show assignments or to answer questions, much like a traditional blackboard.

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The purpose of IPDS is to provide an easy to use system for creating and controlling video presentations. A description of IPDS features follows:

I. SET FOREGROUND COLOR

The <F1> key allows the user to select one of 16 foreground colors for subsequent characters.

II. SET BACKGROUND COLOR

The <F2> key allows the user to select one of 8 background colors for subsequent characters.

III. CLEAR SCREEN

The <F3> key clears the the screen work area to the current background color.

IV. SET BORDER COLOR

The <F4> key allows the user to select one of 8 colors for the border surrounding the screen work area.

V. SELECT VIDEO PAGE

The <F5> key allows the user to select the currently displayed video page; four are available.

VI. STORE SCREEN

Pressing the <F7> key will initiate the screen storage sequence. The prompt "filename:" will then be displayed. If the response is a valid file specification then the current video screen is saved in this file. If <return> is entered then no action is taken.

VII. RETREIVE SCREEN

Pressing the <F8> key will initiate the screen retrieval sequence. The prompt "filename:" will then be displayed. If the response is a valid and existent file specification the current video screen will be loaded with the screen stored in this file.

VIII. EXIT IPDS

Pressing <F9> will return the user to DOS.

IX. CREATE BLOCK

A block primitive is available to draw double line boxes. Its use requires three steps:

- 1) Position the cursor at the upper right hand corner of the intended block and press <ALT>7. This sets the first marker.
- 2) Position the cursor at the lower left hand corner of the intended block and press <ALT>6. This sets the second marker.
- 3) Press <ALT>8. This will draw the double line block with the previously specified corners.

X. SET CURSOR TYPE

Pressing the <ALT>9 combination allows the user to select the current cursor character. There are several pointers, an underscore, and a cross available.

XI. SELECT SCRIPT

Pressing the <ALT>0 combination will initiate the script selection sequence. The prompt "script:" will then be displayed. If the response is a valid script file specification then the current script will be this file.

Pressing <PgDn> will cause the next screen to be read from the script list and displayed in the current video screen.

Pressing <PgUp> will cause the previous screen to be read from the script list and displayed in the current video screen.

Screens are created through any standard text editor and include quoted screen names with border color numbers.

XII. QUICK REFERENCE LIST

- ⟨F1⟩ - Next foreground color.
- ⟨F2⟩ - Next background color.
- ⟨F3⟩ - Clear screen.
- ⟨F4⟩ - Next border color.
- ⟨F5⟩ - Next video page.
- ⟨F7⟩ - Store screen.
- ⟨F8⟩ - Retrieve screen.
- ⟨F9⟩ - Exit IPDS.

- ⟨ALT⟩6 - Set block marker 2.
- ⟨ALT⟩7 - Set block marker 1.
- ⟨ALT⟩8 - Draw double line block.
- ⟨ALT⟩9 - Next cursor type.
- ⟨ALT⟩0 - Select script file.

- ⟨PgDn⟩ - Display next screen in the script file.
- ⟨PgUp⟩ - Display previous screen in the script file.

ATTACHMENT 5.8

**"THE USL NASA PC R&D PROJECT:
DETAILED SPECIFICATIONS OF OBJECTIVES,"**

FRANK Y. CHUM,

PHILIP P. HALL, DENNIS R. MOREAU, AND

SPIROS TRIANTAFYLLOPOULOS,

USL/DBMS NASA/PC R&D WORKING PAPER SERIES

REPORT NUMBER DBMS.NASA/PC R&D-8.

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WORKING PAPER SERIES

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THE USL NASA PC R&D PROJECT:
DETAILED SPECIFICATIONS OF OBJECTIVES

Frank Y. Chum
Philip P. Hall
Dennis R. Moreau
Spiros Triantafyllopoulos

The University of Southwestern Louisiana
Computer Science Department
Lafayette, Louisiana

August 15, 1984

THE USL NASA PC R&D PROJECT:
DETAILED SPECIFICATIONS OF OBJECTIVES

ABSTRACT

This document represents the specifications for a number of tasks which are to be implemented within the USL NASA PC R&D Project. The goals and objectives of the PC development project and the interrelationships of the various components are discussed. Six individual tasks are described. They are a NASA/RECON simulator, a user interface to multiple remote information systems, evaluation of various personal computer systems, statistical analysis software development, interactive presentation system development, and the development of a distributed processing environment. The relationships of these projects to each other and to the goals and objectives of the overall project are also discussed.

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THE USL NASA PC R&D PROJECT:

DETAILED SPECIFICATIONS OF OBJECTIVES

I. INTRODUCTION

The USL NASA PC R&D Project was initiated in an effort to explore the possible utilizations of personal computers as tools for use by engineers and scientists in the processing of information. Recent advances in personal computer technology and resultant increases in the performance/cost ratio of these machines has made them increasingly attractive replacements for terminals as a method of accessing remote information systems. The information processing capabilities associated with personal computers make them particularly attractive to engineering and scientific personnel who desire both local processing capabilities and access to remote information.

The primary direction of research efforts initiated by the project has been the development of a research environment to be utilized by the project and the development of specifications for a number of activities addressing individual tasks within the

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overall scope of the project. The research environment development is a continuous process which includes the evaluation and testing of both hardware and software tools. All specifications are developed with the goal of maintaining maximum flexibility and portability. The environment available for use by project members will therefore continue to evolve over time.

II. GENERAL GOALS AND OBJECTIVES

The purpose of this project is to develop personal computer based tools which will be valuable to scientific and engineering professionals. The following general goals will be used as a framework for these development efforts:

1. Create an environment for PC research and development activities.
2. Develop an integrated PC-based environment for scientific and engineering professionals.
3. Provide PC-Based instructional tools for training in the use of information storage and retrieval systems (IS&Rs).

These goals will be achieved by specifying objectives and initiating tasks to accomplish those objectives. The following is a list of currently identified objectives.

OBJECTIVES:

1. The objectives for establishing a PC R&D environment include:
 - 1.1 Continually evaluate available PC hardware and software for potential incorporation into the PC R&D projects.
 - 1.2 Develop procedures and specifications for PC R&D activities.
 - 1.3 Identify and evaluate candidate research and development projects.
2. The objectives for developing an integrated PC-based environment include:
 - 2.1 Develop a general means of transporting data between tools in the local environment.
 - 2.2 Develop applications tools for prototyping an integrated PC-based environment.
 - 2.3 Develop a general system for transparent sharing and access of resources in a distributed environment.

- 2.4 Develop a consistent means for accessing resources located in a remote processing environment.
- 3. The objectives for providing CAI tools for IS&R training include:
 - 3.1 Develop a simulator for Computer Aided Instruction (CAI) in the use of IS&R systems.
 - 3.2 Develop a simulator generator, retargetable for various IS&R systems.

III. SPECIFIC OBJECTIVES OF INITIATED TASKS

This section describes the status of tasks currently in progress within the PC R&D project and outlines the objectives which each task is intended to accomplish. Each of these tasks is represented by one or more entries in the USL NASA PC R&D Working Paper Series and complete information on the specifications is available in these documents.

3.1 Evaluation of Currently Available PC Hardware/Software

This task addresses Goal 1 Objective 1.1 described in Chapter II. Rapid changes in PC hardware and software technology mandate a continual evaluation of available products in this area. New technological offerings may potentially be incorporated into ongoing R&D efforts or may make previously impractical explorations feasible.

Our primary criteria for evaluation will include qualitative, as well as, quantitative parameters. Qualitatively, we will be concerned with characteristics such as ease of use, documentation quality, training facilities, flexibility, manufacturer support, and maintainability. Quantitatively, we

will evaluate products in terms of benchmark performances, price/performance ratios, compatability with existing systems, reliability, and expandability.

This data will be compared against the results from previous evaluations and used in determining product adaptability to our PC R&D needs.

3.2 Statistical Analysis Software

This task addresses Goal 2 Objective 2.2 in Chapter II. Statistical analysis is a widely used process, especially in an engineering or scientific environment. However, few packages have the potential for integrating with other existing packages for other tasks, or operate in a multiple mode environment.

The USL NASA PC R&D statistical package was designed with computational power, design flexibility, ease of use, efficiency, accuracy, and transportability as the main design goals [Bassari et al., 84]. Multiple mode operation will allow the user to apply the same methods to a stand-alone interactive package, a batch language, and a library package.

The applicability of statistical analysis to other fields such as information storage and retrieval or text processing

makes integration of the statistical package with other packages mandatory. A high degree of cooperation will exist between applications, in order to improve the total workstation efficiency.

The package developed will have the capability of processing requests for one- and two-way statistics, regression analysis, ANOVA, and other facilities required by the user community. In addition, due to a modular design, new local functions can be added without major modifications.

3.3 Prototype Interactive Presentation System

This task addresses Goal 2 Objective 2.2 in Chapter II above. Users in an integrated workstation environment should have access to tools which assist them in all information related job functions. The Interactive Presentation Development System (IPDS) was developed as a tool for a prototype workstation environment in which data will be easily transferred between tools [Moreau, 84b].

IPDS is a very interactive system for creating, editing, and displaying video presentation sequences. It is designed for users with little or no computer experience, and can be used

effectively with just a few minutes practice.

Users interact with IPDS through the keyboard, creating text with normal keys and invoking special functions with <alt> combinations and function keys. Once a particular screen is created it can be stored into a screen file for subsequent retrieval .

Script files may be created, containing a list of screen file names to be used in a presentation sequence. Users can step through the sequence forward or backward, focusing attention to areas of the screen with special cursor pointers. Screens may be dynamically modified during the presentation to show assignments or to answer questions, much like a traditional blackboard.

3.4 Distributed Workstation

This task addresses Goal 2 Objective 2.3 in Chapter II described above. The proposed PC-Based Distributed Workstation (PCDWS) prototype will give the users (scientists and engineers) an integrated PC-Based workstation environment for transparent access and sharing of resources available from both local and remote facilities [Chum, 84].

The PCDWS will provide a robust personal computer workstation environment with a comprehensive set of tools as functional components to serve as a scientist's/engineer's R&D workbench. It will also provide distributed/networked workstation intercommunication and uploading/downloading protocols between workstation and remote mainframes as well as between workstations, thus providing access to multiple local and/or remote DEMSs and IS&R systems.

3.5 PC-Based User Interface

This task addresses Goal 2 Objective 2.4 of the Project as described in Chapter II of this document. This objective addresses the provision of a consistent means for accessing resources located in a remote processing environment. This specific task involves the design and prototyping of a common user interface to multiple information storage and retrieval systems [Hall, 84].

A set of design criteria will be developed which will guide the development of an interface system to provide the user with the functionality required to retrieve, store and manipulate data residing in remote information systems. The design will provide the user with a common interface to be used in interaction with

all information systems he wishes to access. The user will therefore "see" all systems through the same interface and will be spared the necessity of learning multiple system command languages and access procedures.

The system will have multi-level capabilities to provide access to users with varying expertise. The user will also be able to utilize the processing capabilities of his personal computer to accomplish whatever local processing of the retrieved information is desired. The system will be designed to allow incorporation of additional systems as the user's needs for information evolve. The interface system is intended to be a part of the larger workstation development project, being developed by the USL NASA PC R&D team.

3.6 PC-Based NASA/RECON Simulator

This task addresses Goal 3 Objective 3.1 of the Project, as found in Chapter II. The design and implementation of an information system simulator has many goals and also needs consideration of many factors.

The main goals of an information system simulator can be defined as tools for effective training of users. The increasing

cost of accessing public, remote information storage and retrieval systems, as well as the increased functionality that these systems have acquired in the process of information manipulation makes training expensive as well as necessary. The simulator can guide the user through a series of complete lessons, if so desired, until he/she is ready for encountering the "real" environment. All this training can be done without expensive costs, at any local PC-based site. Also, in case of advanced usage, the features can be first seen and learned in the simulator, thus increasing the efficiency and improving the cost/performance ratio of the user.

Other goals addressed in the design of such a simulator include prototyping, user/machine interface effectiveness measurement, testing of new search strategies, testing of new procedures, etc.

Research and development will also be performed in the field of information system simulator generators, that will allow parameterization of existing information systems, and simulator generators derived out of these specifications. These systems will be able to simulate a given existing system, as well as prototype a non-existing one for modeling purposes.

IV. RELATIONSHIPS OF INITIATED TASKS TO GOALS

Figure 1 illustrates the relationship between PC R&D project goals. Each task is identified in the previous chapter as supporting a particular objective of one of these goals.

The PC hardware/software evaluation task is essential in establishing a PC R&D environment. It will not only help us in the selection of initial products, but give us a procedure for evaluating future products.

Both the statistical analysis package and the Interactive Presentation Development System are tools for incorporation in the prototype integrated PC workstation. They provide a testbed for exploring data transfer mechanisms.

The distributed workstation prototype specifications address a distributed environment for transparent sharing and accessing of non-local resources. With the advances of local area network technology, this has become a significant component of the overall integrated workstation design.

The PC-based user interface is the first step in addressing access to remote processing resources. It will deal with problems that must be addressed in all phases of the overall integrated workstation design and so will refine our approach to

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others areas as well.

The PC-based NASA/RECON simulator development is intended to fulfill an immediate need of providing a means of training individuals in the utilization of this specific system. It will be a basis for the future development of a retargetable simulator generator for use in training courses developed for other information systems.

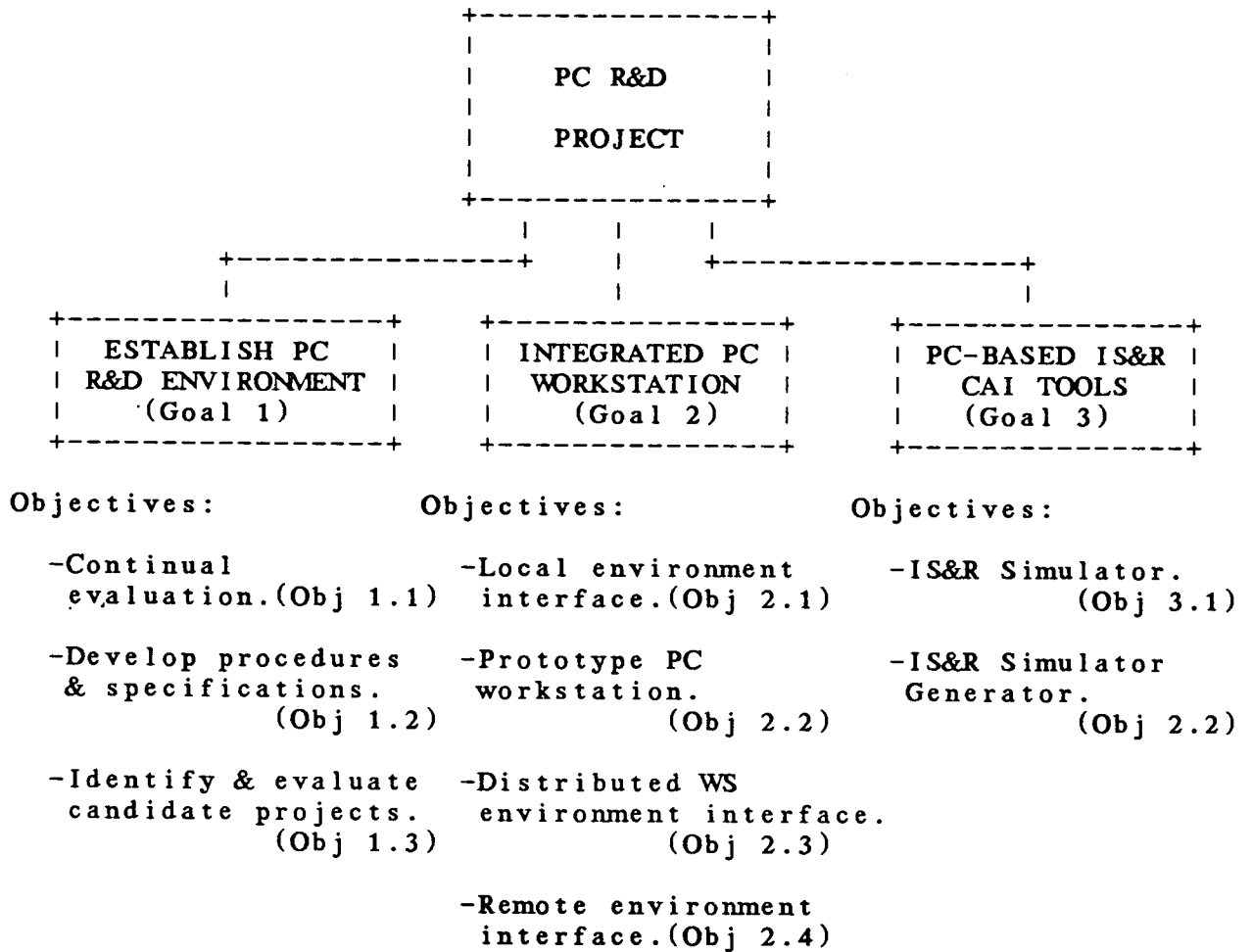


Figure 1. Relationship Between PC R&D Goals

V. SUMMARY AND CONCLUSIONS

Each of the tasks described in this document addresses a particular objective of our primary purpose, which is to explore the utilization of personal computer by scientists and engineers in their information processing activities. These tasks will help to establish an environment for addressing our goals, help to refine our perception of the problems to be solved and establish a framework for the initiation of the future tasks of the USL NASA PC R&D project.

VI. REFERENCES

- [Bassari et al. 84] Bassari, Jinous and Spiros Triantafyllopoulos, "General Specifications for the Development of a USL NASA PC R&D Statistical Analysis Support Package," USL/DEMS NASA/PC R&D Working Paper Series, Report Number DEMS.NASA/PC R&D-5, August 2, 1984, 14p.
- [Chum 84] Chum, Frank Y., "General Specifications for the Development of a USL NASA PC R&D Distributed Workstation," USL/DEMS NASA/PC R&D Working Paper Series, Report Number DEMS.NASA/PC R&D-6, August 15, 1984, 10p.
- [Dominick 84] Dominick, Wayne D., "The USL NASA PC R&D Project: General Specifications of Objectives," USL/DEMS NASA/PC R&D Working Paper Series, Report Number DEMS.NASA/PC R&D-2, June 6, 1984, 6p.
- [Hall 84] Hall, Philip P., "Design Criteria for a PC-Based Common User Interface to Remote Information Systems," USL/DEMS NASA/PC R&D Working Paper Series, Report Number DEMS.NASA/PC R&D-9, August 13, 1984, 21p.

[Moreau 84a] Moreau, Dennis, "The USL NASA PC R&D Development Environment Standards," USL/DBMS NASA/PC R&D Working Paper Series, Report Number DBMS.NASA/PC R&D-3, July 31, 1984, 8p.

[Moreau 84b] Moreau, Dennis R., "The USL NASA PC R&D Interactive Presentation Development System," USL/DBMS NASA/PC R&D Working Paper Series, Report Number DBMS.NASA/PC R&D-7, August 2, 1984, 8p.

[Triantafyllopoulos 84] Triantafyllopoulos, Spiros, "General Specifications for the Development of a PC-Based Simulator of the NASA RECON System," USL/DBMS NASA/PC R&D Working Paper Series, Report Number DBMS.NASA/PC R&D-4, August 2, 1984, 21p.

ATTACHMENT 6.1

**NASA/RECON SPECIAL TRAINING WORKSHOP
AT USL: WORKSHOP AGENDA,
LIST OF PARTICIPANTS, AND
COMPLETION CERTIFICATES**

January 1984

RECON TRAINING WORKSHOP AGENDA (SPECIAL)

UNIVERSITY OF SOUTHWESTERN LOUISIANA
Lafayette, Louisiana

Tues. 8:45 a.m. to Thurs., 12:00 noon

JANUARY 31 - FEBRUARY 2, 1984

TUESDAY, JANUARY 31, 1984

*** USL UNION SHADOWS ROOM

08:45 - 09:15	<u>Welcome and Training Overview</u>	<u>Dominick/Roque- more/Eckert</u>
09:15 - 10:00	<u>NASA Data Base/File Structures</u> <ul style="list-style-type: none">• Linear Files• Inverted Files• File Collections on RECON• Document Origin/Categories• Prime Data Base• Alternate Data Base• Special Series	<u>Eckert</u>
10:15 - 11:00	<u>Basic Commands - I</u> <ul style="list-style-type: none">• Dial-In Procedures• Begin Search, BB• Select• Combine• Display• End Search• End Search Bypass• Expand• Help• Page	<u>Wynne</u>
11:00 - 11:50	<u>Group Tutorials</u> Group A - Eckert Group B - Wynne	
11:50 - 01:00	<u>Lunch</u>	
01:00 - 01:45	<u>Basic Commands - II</u> <ul style="list-style-type: none">• Specify Format• Sort• Keep (Set 99) - Ejection of unwanted citation• Release, Limit, Limit All• Type (local), Print (overnight)	<u>Eckert</u>
01:45 - 02:45	<u>Group Tutorials</u> Group A - Wynne Group B - Eckert	
03:00 - 03:45	<u>Elementary Search Strategies</u> <ul style="list-style-type: none">• Subject• Report/Contract/Author/Corporate Source• Text Search (Abstract and Title Families)	<u>Wynne</u>
03:45 - 04:30	<u>Group Tutorials</u> Group A - Eckert Group B - Wynne	

WEDNESDAY - FEBRUARY 1, 1984

*** USL UNION SHADOWS ROOM
Eckert

08:30 - 09:00

RECON Advanced Commands

- Frequency
- Text Search (Includes numeric words and proximity searching)
- Root Search/Range Search

09:00 - 10:00

Group Tutorials

Group A - Wynne
Group B - Eckert

10:15 - 10:45

Search Expression

Wynne

10:45 - 11:50

Group Tutorials

Group A - Eckert
Group B - Wynne

11:50 - 01:00

Lunch

01:00 - 01:10

Communicating with NASA or Facility

- RECON Coordinator/STIB Staff
- When to Call Local Serviceman
- RECON Bulletins/Pocket Guides

Eckert

01:10 - 01:20

RECON Printouts

- How Handled
- Evaluation Sheets

Wynne

01:30 - 01:30

Indexing/Thesaurus Construction

Eckert

01:30 - 02:15

NALNET - V10K and V50K Series

Eckert

02:15 - 02:45

Group Tutorials

Group A - Wynne
Group B - Eckert

02:45 - 03:15

Stored Search Introduction

Eckert

- Stored Searches at the Facility for your use
- Monthly Limits

03:15 - 03:45

Group Tutorials

Execute Facility NASAPUBS for 1968-1984 and for December 1984

Group A - Eckert
Group B - Wynne

04:00 - 04:30

Stored Search Techniques

Wynne

THURSDAY, FEBRUARY 2, 1984

*** USL UNION CYPRESS ROOM

08:30 - 09:15

Stored Search Techniques Review

Wynne

09:15 - 10:15

Group Tutorials

Store Sample Search and Execute for 1983; also for December 1983

10:30 - 11:00

Pocket Guide Review

11:00 - 12:00

Review/Wrapup

LIST OF PARTICIPANTS:

NASA/RECON TRAINING WORKSHOP (SPECIAL)
UNIVERSITY OF SOUTHWESTERN LOUISIANA
Lafayette, Louisiana

Tues. 8:45 a.m. to Thurs., 12:00 noon
JANUARY 31 - FEBRUARY 2, 1984

UNIVERSITY OF SOUTHWESTERN LOUISIANA

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CMPS Graduate Student and
SU Faculty

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Department of Computer Science
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(504) 771-2060

Certificate of Completion

The University of Southwestern Louisiana

and

The National Aeronautics and
Space Administration (NASA)

This is to certify

LERoy ROQUEMORE

has participated in a BASIC and ADVANCED NASA/RECON TRAINING WORKSHOP sponsored by
NASA and the Computer Science Department of USL.

This Certificate of Completion, awarded this second day of February 1984, is given in recognition of the
participant's successful completion of the prescribed program.

Philip F. Eckert
Manager
RECON & Special Projects Department
NASA Scientific and
Technical Information Facility

Hal Wynne
Supervisor (Retired)
RECON Retrieval Unit
NASA Scientific and
Technical Information Facility

Wayne D. Dominick
NASA/RECON Contract
USL Principal Investigator
USL Computer Science Department

ATTACHMENT 6.2

**NASA/RECON SPECIAL TRAINING WORKSHOP
AT USL: PARTICIPANTS EVALUATION FORM
SUMMARY RESULTS**



The University of Southwestern Louisiana

Lafayette, Louisiana 70504



Computer Science Department
P.O. Box 44330
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Université des Acadiens

February 20, 1984

Mr. Philip Eckert and
Mr. Hal Wynne
NASA STI Facility
P. O. Box 8757
Baltimore/Washington
International Airport
Maryland 21240

Dear Phil and Hal:

As I mentioned in my February 7 letter to you, we would be providing you with additional feedback concerning the NASA RECON Workshop which you conducted at USL on January 31 - February 2, 1984. That additional feedback is attached (sorry for the delay, but I have been out of town for almost 10 days out the past two weeks).

As part of obtaining this additional feedback, we developed a simple Workshop Participant's Evaluation Form which was distributed to all 22 participants within the workshop. After collecting all completed forms, we compiled the information illustrated within the attached document.

In essence, the attachment presents the following four basic categories of information:

- (1) Summary results from the completed evaluation forms (pages 1-2 of the attached document represent the actual evaluation form itself, with the summary results superimposed in the right margin - the form consisted of 12 specific questions requiring a rating along a four-point scale, plus two open-ended questions).
- (2) A statistical analysis of the questionnaire results (page 3 of the attached document represents, for each numbered question, the sample size (22 in all cases), the mean value on a scale of 1 to 4, and the standard deviation; plus a simple 95% confidence interval for the level means of each question).
- (3) Verbatim text of the participant's supplied responses to the open-ended question requesting specific comments on the numbered items on the questionnaire (pages 4-6 of the attached document).

Philip Eckert/Hal Wynne
February 20, 1984
Page 2.

- (4) Verbatim text of the participant's supplied responses to the open-ended question requesting general comments on the workshop (pages 7-8 of the attached document).

From looking at the summary results, I think that both of you should feel quite proud at having conducted such a successful workshop. For example, the overall rating (Question 12: "Overall Rating of the Workshop") of 3.773 on a scale of 4.0 is quite spectacular! The full comments also certainly confirm this high evaluation of the quality of the workshop on the part of the workshop participants.

Again, both Leroy and I wish to thank both of you one more time for the terrific job that both of you did and for all of the time that you gave us and all of our people. We have certainly benefited from that time immensely and will put that knowledge to excellent use within the NASA RECON contract activities.

Sincerely,

Wayne D. Dominick

Wayne D. Dominick
USL NASA Contract Principal Investigator

cc: Mr. John H. Wilson, Jr., NASA, HQ
Dr. Leroy Roquemore, Southern University NASA
Contract Principal Investigator

cp

Attachment

PARTICIPANTS EVALUATION FORM: SUMMARY RESULTS

NASA/RECON TRAINING WORKSHOP (SPECIAL)
UNIVERSITY OF SOUTHWESTERN LOUISIANA
Lafayette, Louisiana

Tues. 8:45 to Thurs., 12:00 noon
January 31 - February 2, 1984

Name _____ Date _____

With respect to the NASA/RECON Training Workshop recently held at USL, please provide your professional evaluation of the following items using the evaluation scale presented below:

	POOR	FAIR	GOOD	EXCELLENT
	1.0	2.0	3.0	4.0
1. Overall Quality of Instruction	_____	_____	_____	_____ 3.77
2. Quality of Training Packages Handouts	_____	_____	_____	_____ 3.59
3. Quality of Presentation Visuals	_____	_____	_____	_____ 3.50
4. Breadth of Material Covered	_____	_____	_____	_____ 3.41
5. Depth of Material Covered	_____	_____	_____	_____ 3.23
6. Distributed of Time Devoted to Major Topical Areas	_____	_____	_____	_____ 3.50
7. Effectiveness of Online Usage Sessions	_____	_____	_____	_____ 3.55
8. Distribution of Time Devoted to Lecture Presentations versus Online Usage Sessions	_____	_____	_____	_____ 3.41
9. Quality of Training Facilities	_____	_____	_____	_____ 3.18
10. Contribution to the Learning of the NASA/RECON System	_____	_____	_____	_____ 3.77
11. Contribution to the Learning of Interactive Information Storage and Retrieval Systems	_____	_____	_____	_____ 3.55
12. Overall Rating of the Workshop	_____	_____	_____	_____ 3.77

Please supply any specific comments that you may have and/or suggested improvements in any of the above numbered evaluation areas:

Item number

Comment/Suggestion

(SEE ATTACHED LIST

OF SPECIFIC COMMENTS)

Please supply any additional general comments that you may have concerning the workshop.

(SEE ATTACHED LIST

OF GENERAL COMMENTS)

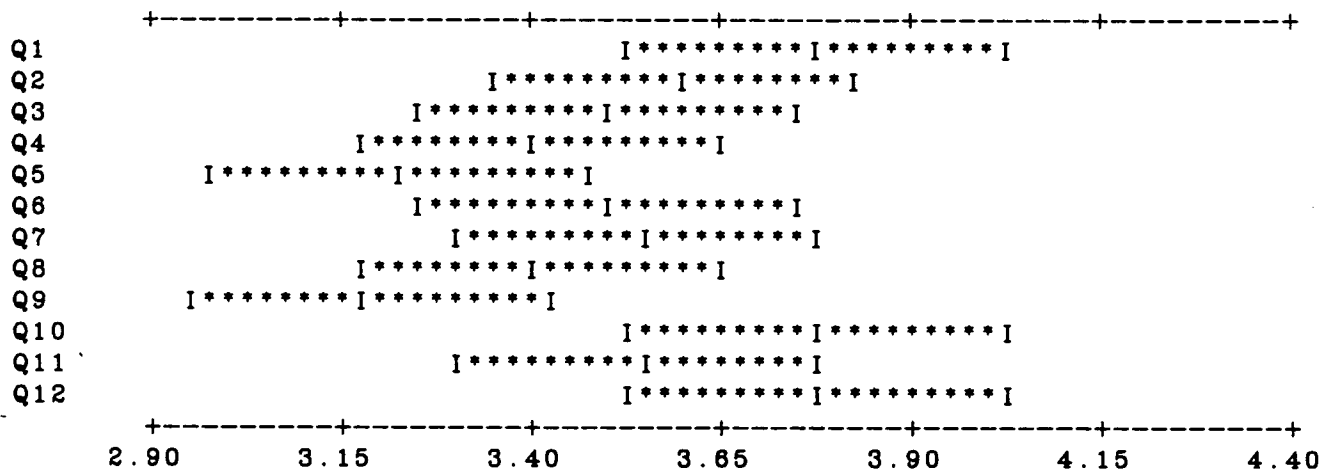
STATISTICAL ANALYSIS OF THE QUESTIONNAIRE RESULTS

=====

QUESTION NUMBER	N	MEAN	ST. DEV.
Q1	22	3.773	0.429
Q2	22	3.591	0.590
Q3	22	3.500	0.512
Q4	22	3.409	0.590
Q5	22	3.227	0.612
Q6	22	3.500	0.512
Q7	22	3.545	0.671
Q8	22	3.409	0.666
Q9	22	3.182	0.733
Q10	22	3.773	0.429
Q11	22	3.545	0.596
Q12	22	3.773	0.429

POOLED ST. DEV. = 0.572

INDIVIDUAL 95 PERCENT C. I. FOR LEVEL MEANS
(BASED ON POOLED STANDARD DEVIATION)



SPECIFIC COMMENTS ON NUMBERED ITEMS

=====

Item number 1

I feel that the overall quality of instruction was excellent. The instructors provided the lectures very clearly and covered the material very thoroughly. I think that the ability of the instructors to relate to each participant during the on-line usage sessions was great.

Item number 2

Quality of training packages, handouts can be improved by using good print to prepare handouts. By introducing some more examples in each section, quality of training packages can be improved.

Very good examples of session in hand outs.

Item number 4

I am glad we had lots of handouts, because so much material was covered so fast, it really helped to be able to go over the material at leisure.

Item number 5

More instruction on the different file collections.

Item number 6

Although the training session was very short (3 days) and topics related to the NASA/RECON were very broad, the major topics such as "search" were explained in detail. Thus, I think that it is very helpful to me to understand the functions of NASA/RECON and to use the system in the future.

We spent some time on "non-heavily-interesting" material while we could have this time available for other topics, such as the INSIDE of RECON, some more implementation details, etc.

A lot of material was covered in about 2 1/2 days, should spread out in 3 whole days.

Only lack of time obliged us to skip and refrain from asking questions.

Item number 7

More time devoted to on-line usage.

Need more sample questions and answers after online usage sessions.

I enjoyed the program very much and found it very informative. However, more time at the terminal would have been appreciated. I realize, of course, the difficulty of dividing 2 terminals between the amount of participants.

It would have been more effective if projector terminals are used.

Facilities were very good considering the time span; however, I would have liked to see more access terminals during the on-line sessions. I was satisfied with the quality of the online sessions, but would have liked to spend even more time. The necessity of having the terminals in two locations did cause a bit of a problem in logistics and necessitated the extending of the lecture/foil presentation before breaking for on-line training.

We would have saved some time if the two modems and terminals had been in the same room or close by. ("Get the key, who has the key, where is the key, Frank has the key...").

Item number 9

More terminals.

The limited number of terminals available made it difficult to allocate sufficient time to each student to interact with the system during the online sessions.

Item number 10

After reading the RECON user's manual and attending the lectures, the hands-on experience greatly enhanced my understanding of the system. I feel that the lectures coupled

with the hands-on sessions are an effective tool.

Item number 11

I improved my knowledge of DBMS/IS&R systems from the workshop activities. Comparing the features & performance of NASA/RECON vs. other IS&R systems I have used, I was able to understand the subject much more.

GENERAL COMMENTS

=====

The workshop was excellent. It was really well organized and supported, although an extra terminal could be used to a good advantage. I learned much more than I expected. Really a professional event! The certificates were a nice idea, also.

It would be nice if a follow-up of implementation details (i.e. a leaflet, handout, book, etc) could be obtained by NASA HQ. about the physical configuration of RECON and made available to the CMPS669 class so that we all know what we are working with.

Very positive experience. Organization, Presentation and Time Online were all "first class".

The few "technical questions" still unanswered (restrictions on SORT, KEEP, lack of consistency in mnemonics, highlighting...) are of minor importance.

The strong points of NASA/RECON (FREQUENCY, KEEP, SORT(S)) were well explained and exemplified.

Any negative points would be irrelevant anyway, since there was no time left to include anything else during these 3 days. Thanks, to all concerned.

The workshop gave me a much clearer understanding of the database environment as well as a deeper appreciation of its complexity. Mr. Wynne's and Eckert's manner made the lecture series both informative and interesting.

Having had the opportunity to participate in the excellent NASA/RECON Training workshop at the University of Southwestern Louisiana, we are now prepared to go forth effectively in our planning for implementing activities associated with achieving objectives of our NASA/RECON contract as it relates to workshops/course development, implementation, evaluation and documentation. In addition, the research capabilities of the Computer Science faculty and students at Southern University-Baton Rouge have been extended through our participation. Phil Eckert, Hall Wynne, and Wayne Dominick are to be congratulated for sponsoring such an excellent NASA/RECON Training Workshop.

Overall - The workshop far exceeded my expectations. Fantastic Job !!

For me this had been one of the best experiences - for hands-on usage on IS&R systems. I think I learned a lot during

tutorial sessions.

The certificates of completion are very nice and appropriate.

I'd like to thank Mr. Phil Eckert and Mr. Hal Wynne and of course Dr. Wayne D. Dominick for providing such a great opportunity to participate in the NASA/RECON Training Workshop.

I have a strong feeling that the workshop activities will contribute significantly to my research within the area of Management Information Systems, particularly Information Storage and Retrieval Systems.

I found it generally to be very satisfactory and informative. I am thankful I was invited to participate.

If it is possible for the next workshop, two (or more) terminals should be located at the same place so that time won't be wasted in running back and forth from one place to another. And get more hands-on experience.

Sometimes we want to know the physical structure (file structure, security level, etc) and design criteria to evaluate the system performance. I expected you to suggest some information about Database design in addition to the usage of the RECON system.

I wish we had been able to spend more time on the system, especially in independent searches. The experience may have been more total if we had had more time to prepare ourselves for it, by reading the handbook, planning each session, etc.

It was not clear the description about the different files.

In the workshop, the lectures only covered basic concepts and usage of RECON. The advanced topics were not included.

Being presently enrolled in the course of Data Base Management, I feel that my participation in the NASA/RECON workshop has given me a better understanding of the course. Also, I obtained valuable knowledge on Information Retrieval for present and future projects.

ATTACHMENT 6.3

**USL COMPUTER SCIENCE DEPARTMENT COURSE
CMPS669 "ADVANCE TOPICS IN COMPUTER-BASED
INFORMATION SYSTEMS (NASA/RECON)"
COURSE SYLLABUS, SPRING 1984**

CMPS 669

ADVANCED TOPICS IN COMPUTER-BASED INFORMATION SYSTEMS
 (NASA RECON)

INSTRUCTOR: Dr. Wayne D. Dominick
 Office: Stephens, Room 133

OBJECTIVES: To provide state-of-the-art knowledge of, and pragmatic, hands-on working experience with, one or more of the largest and most sophisticated interactive information storage and retrieval systems in existence and in production use at the present time. Access to such systems will be provided pursuant to contract research to be performed for the National Aeronautics and Space Administration (NASA).

PREREQUISITES: CMPS560 and Consent of Instructor

SCHEDULING: To Be Determined Based on Participants Schedules

COURSE FORMAT: Lecture (1/4)
 Seminar (3/4)
 Small study groups to work on projects

REQUIREMENTS:	% of grade
Seminar participation	20 %
Information system usage tasks	30 %
One individual or group project	50 %
- Oral proposal presentation	
- Oral final presentation	
- Written final report	

COURSE OVERVIEW (TOPICS TO BE ADDRESSED):

Pursuant to the specifications of a research contract to be entered into in December, 1983 with the National Aeronautics and Space Administration (NASA), the Computer Science Department at USL will be working jointly with the Department of Computer Science at Southern University to address a variety of research and educational issues relating to the use of some of the largest interactive information storage and retrieval systems currently in use at the present time.

The specific systems to be addressed within the scope of this work are projected to include the following:

- [1] NASA / RECON
- [2] DIALOG
- [3] DEPARTMENT OF ENERGY / RECON
- [4] DEPARTMENT OF DEFENSE / DTIC / DROLS
- [5] ENVIRONMENTAL PROTECTION AGENCY / CSIN - Chemical Substance Information Network
- [6] LAWRENCE LIVERMORE NATIONAL LABORATORY / TIS - Technology Information System, Intelligent Gateway System.

As this is projected to be a 6-8 year funded contract, access to these systems will be spread out over a several year time frame. However, during the Spring Semester, 1984, access will be provided at least to the NASA / RECON system for use within this offering of CMPS669.

The overall orientation of the CMPS669 activities will be to address both state-of-the-art aspects and pragmatic usage aspects of these systems. In particular, CMPS669 will provide the framework for applying the general concepts presented in CMPS56X-type courses to one or more of these specific systems. Generically, the types of concepts to be applied will include the following:

--- FEATURE ANALYSIS OF INTERACTIVE INFORMATION STORAGE AND RETRIEVAL SYSTEMS

- User Categorizations
 - System Administrators
 - Data Base Administrators
 - Applications Programmers
 - Information Specialists
 - End Users
 - Parametric Users

- Data Models
 - Hierarchical Data Model
 - Network Data Model
 - Relational Data Model
 - Flat File Model
- Logical Data Structures
 - Item Level
 - Group Level
 - Record Level
 - File Level
 - Data Base Level
- Physical Storage Structures
 - Data Representation Considerations
 - Data Characteristics Considerations
 - Device Characteristics Considerations
 - Storage Structuring and Accessing Techniques
- Data Base Definition
 - Data Definition
 - Data Relationships Definition
 - Data Value Integrity Constraints
 - Data Indexing
 - Data Base Definition Languages
- Data Base Interrogation/Searching
 - Basic Selection Constructs
 - Index Searching vs. Data File Searching
 - String Matching Options
 - Existence Checking
 - Compound Conditions
 - Data Base Searching Languages
- Data Base Report Generation
 - Online vs. Offline Report Generation
 - System Default Report Formats
 - User-Defined Report Formats
 - Alternate Output Formats
 - Report Generation Languages
- Data Base Update
 - Update Operations
 - Update Modes
 - Update Data Formats
 - Update History Files
 - Update Utilities
 - Update Access Control

- Data Base Update Languages
- Data Base Redefinition
 - Logical Data Structure Redefinition
 - Physical Storage Structure Redefinition
 - Redefinition Facilities
 - Data Base Redefinition Languages
- Administrative Functions
 - System Administrator Functions
 - Data Base Administrator Functions
- Data Base Security Considerations
 - Authentication
 - Authorization
 - Privacy/Security Transformations
 - Security Logging
- Performance Measurement and Evaluation
 - System Execution Efficiency Orientations
 - User Interface/Interaction Orientations
 - PME Tools and Techniques
 - Privacy Considerations
- BIBLIOGRAPHIC DATA BASE DESIGN
 - Bibliographic Data Items/Fields
 - Bibliographic Record Formats
 - Document Files
 - Index Files
 - Thesaurus Files
 - Sample Search Files
 - User Profile Files
- BIBLIOGRAPHIC FILE STRUCTURES
 - Linear File Organizations
 - List Structured File Organizations
 - Multi-List Files
 - Inverted Files
 - Clustered File Organizations
 - Cluster Generation
 - Cluster Definition
 - Cluster Searching

--- VOCABULARY CONTROL

- Controlled Vocabularies
 - Pre-Controlled Vocabularies
 - Post-Controlled Vocabularies
- Free Text Approaches
- Thesaurus Support
 - Broader Terms
 - Narrower Terms
 - Synonyms
 - Abbreviations
 - Related Terms

--- BIBLIOGRAPHIC DATA BASE SEARCHING

- Types/Levels of Search Languages
 - Procedural, Host-Language-Based Languages
 - Self-Contained, Structured Query Languages
 - Procedure Definition and Invocation Languages
 - Interactive, Prompting-Oriented Languages
 - Batch, Forms-Oriented Languages
 - Interactive, Forms-Oriented Languages
 - List/Menu Selection Languages
 - Restricted Natural Languages
 - Unrestricted Natural Languages
 - Integrated Combinations of the Above
- Search Formulation Features
 - Search Field Control
 - Single Term Searching
 - Phrase Searching
 - Term Proximity Searching
 - Term Range Searching
 - Root Searching/Suffix Strip/Prefix Strip Searching
 - Substring Searching
 - Dictionary Searching
 - Thesaurus Searching
 - Relational Operation Usage
 - Logical (Boolean) Operation Usage
 - Request Sets/Search Sets
 - Search Profiles/Saved Search Strategies
 - Search Review

- Output Generation Features
 - Online/Offline Output Generation
 - Pre-Defined Output Formats
 - User-Defined Output Formats
 - Rapid Scan
 - Expanding
 - Highlighting
 - Sorting
 - Ranking
- Instructional/Diagnostic Features
 - Online System Documentation
 - Online Data Base Documentation
 - Online Training
 - Error Diagnostic Facilities
 - Sample Searches
 - Search Logic Tracing
- ADDITIONAL IS&R APPLICATION AREAS
 - Selective Dissemination of Information (SDI) Systems and Current Awareness Systems
 - Support For Personal Files
 - Interfaces With Document Delivery Systems
- IS&R PERFORMANCE MEASUREMENT AND EVALUATION.
 - Phases of the PME Life Cycle
 - Identification of Generic Evaluation Objectives
 - Identification of Detailed Measurement Parameters
 - Selection of Measurement Mechanisms
 - Identification of Required Data Analyses
 - Design/Conduct of Data Collection Experiments
 - Conduct of Data Analysis/Evaluation Activities
 - Identification of Desired Improvements/Enhancements
 - Implementation of Identified Enhancements
 - Repetition of Cycle as Dictated by Objectives
 - Traditional, Obtrusive User Monitoring
 - Controlled Usage Experiments
 - Use of Human Subjects
 - Subjective User Assessments
 - Recall and Precision Analysis
 - Failure Analysis
 - Data Base Coverage Analysis

- Advanced, Unobtrusive User Monitoring
- Quasi-Controlled Usage Experiments
- Unobtrusive Software Monitoring Facilities
- System Usage Profile and Data Base Usage Profile Analysis
- Timing Analysis
- User Error and Error Recovery Analysis
- Direct and Surrogate Measures of User Success
- Automated Statistical Data Analysis
- Trend Analysis/Projection Analysis

--- FUTURE INFORMATION STORAGE AND RETRIEVAL SYSTEMS

- Assessment of Current State-of-the-Art
- Identification of Current Research Trends
- Projection of Future System Capabilities

REQUIRED READINGS:

- [1] The NASA Contract Research & Development Proposal and all subsequent reports prepared pursuant to that proposal.
- [2] System and data base documentation associated with the specific information systems that will be addressed within the scope of the course. At a minimum, this will include all documentation associated with the NASA RECON system. In general, such documentation would include:
 - [a] System users manuals
 - [b] System update bulletins
 - [c] Data base guides
 - [d] Data base thesauri
 - [e] Data base update bulletins.

OTHER REFERENCES:

- [1] Selected articles addressing state-of-the-art reviews of the aforementioned information systems.
- [2] Other system and/or data base reference material that may be provided by the funding agency for this work.

ATTACHMENT 6.4

**USL CMPS669 STUDENT TASKS/ASSIGNMENTS
TASKING SPECIFICATIONS DOCUMENT:
SPRING SEMESTER, 1984**

O: 01/16/84
R: 02/20/84

CMPS 669 - STUDENT TASKS / ASSIGNMENTS

(1) NASA/CMPS669 LIBRARY.

- (a) Identify relevant IS&R state-of-the-art reading material and reference material, e.g., journal articles, books, government reports, etc. [LiuIH & PenaCA; GranierMR (Government Documents Only)]
- (b) Definition, population, and maintenance of a MADAM data base of all such reading material and reference material. [LiuIH & PenaCA]

(2) DBMS.NASA/RECON WORKING PAPER SERIES.

- (a) Identification of potential topics for inclusion within the DBMS NASA/RECON Working Paper Series. [ANY PARTICIPANT]
- (b) Contribution of potential entries for this Working Paper Series based on CMPS669 course work performed. [ANY PARTICIPANT]
- (c) For each potential entry submitted by a CMPS669 student, two other CMPS669 students will serve as the reviewers for the entry to ensure that all student submissions are subjected to a peer review process. [ALL PARTICIPANTS WILL SERVE AS REVIEWERS]

(3) CONTRACT NEEDS ANALYSIS PHASE.

- (a) Attend/participate in NASA/RECON workshop, assuming that WDD can get this workshop scheduled locally (either at USL or at SU). [COMPLETED AT USL: 01/31/84-02/02/84]
- (b) Assist in identifying target institutions for the needs analysis questionnaire distribution. [DominickWD & ChumFY & TriantafyllopoulosS]

O: 01/16/84
 R: 02/20/84

- (c) Assist in developing the needs analysis questionnaire.
 [INPUT: ALL PARTICIPANTS; FINALIZATION: KnellerMS & GranierMR]
 - (d) Survey targeted institutions. [DominickWD & RoquemoireL]
 - (e) Analysis of questionnaire results. (Should not require more than 1-2 students over a period of 1-2 weeks.)
 [GallagherMC & KaviS]
 - (f) Evaluation of phase activities. [DominickWD & RoquemoireL & RAs]
 - (g) Interim Report No. 1. [DominickWD & RoquemoireL]
- (4) NASA RECON SYSTEM USAGE.
- (a) Extent of actual hands-on usage by CMPS669 students will depend heavily on on-line system connect time/telephone line charges and budget constraints.
 - (b) At a minimum, students will at least make recommendations for content of course usage assignments.
 - (c) May have only selected students actually performing the on-line interactive sessions.
- (5) NASA CONTRACT EQUIPMENT SELECTION.
- (a) Terminals versus PC-based workstations. [INPUT: ALL KNOWLEDGEABLE PARTICIPANTS; FINAL RECOMMENDATIONS: TriantafyllopoulosS & ChumFY]

O: 01/18/84
R: 02/20/84

(6) COURSE VISUALS DEVELOPMENT.

Topic areas will cover all of the areas identified within the CMPS669 syllabus. Students will propose/select specific topic area(s) and proceed to develop associated topic visuals. This task will represent a major portion of the student work within CMPS669. Topic areas will include, but not necessarily be limited to the following:

--- FEATURE ANALYSIS OF INTERACTIVE INFORMATION STORAGE AND RETRIEVAL SYSTEMS

--- User Categorizations [HallPP]
--- System Administrators
--- Data Base Administrators
--- Applications Programmers
--- Information Specialists
--- End Users
--- Parametric Users

--- Data Models [SriAR]
--- Hierarchical Data Model .
--- Network Data Model
--- Relational Data Model
--- Flat File Model

--- Logical Data Structures [NamK]
--- Item Level
--- Group Level
--- Record Level
--- File Level
--- Data Base Level

--- Physical Storage Structures [NamK]
--- Data Representation Considerations
--- Data Characteristics Considerations
--- Device Characteristics Considerations
--- Storage Structuring and Accessing Techniques

--- Data Base Definition [ElMougySA]
--- Data Definition
--- Data Relationships Definition
--- Data Value Integrity Constraints
--- Data Indexing
--- Data Base Definition Languages

O: 01/18/84
 R: 02/20/84

- Data Base Interrogation/Searching [GranierMR]
 - Basic Selection Constructs
 - Index Searching vs. Data File Searching
 - String Matching Options
 - Existence Checking
 - Compound Conditions
 - Data Base Searching Languages
- Data Base Report Generation [SriAR]
 - Online vs. Offline Report Generation
 - System Default Report Formats
 - User-Defined Report Formats
 - Alternate Output Formats
 - Report Generation Languages
- Data Base Update [ElMougySA]
 - Update Operations
 - Update Modes
 - Update Data Formats
 - Update History Files
 - Update Utilities
 - Update Access Control
 - Data Base Update Languages
- Data Base Redefinition [ElMougySA]
 - Logical Data Structure Redefinition
 - Physical Storage Structure Redefinition
 - Redefinition Facilities
 - Data Base Redefinition Languages
- Administrative Functions [ElMougySA]
 - System Administrator Functions
 - Data Base Administrator Functions
- Data Base Security Considerations [YuWC]
 - Authentication
 - Authorization
 - Privacy/Security Transformations
 - Security Logging
- Performance Measurement and Evaluation [KaviS]
 - System Execution Efficiency Orientations
 - User Interface/Interaction Orientations
 - PME Tools and Techniques
 - Privacy Considerations

O: 01/16/84
 R: 02/20/84

- BIBLIOGRAPHIC DATA BASE DESIGN [NamK]
 - Bibliographic Data Items/Fields
 - Bibliographic Record Formats
 - Document Files
 - Index Files
 - Thesaurus Files
 - Sample Search Files
 - User Profile Files
- BIBLIOGRAPHIC FILE STRUCTURES [NamK]
 - Linear File Organizations
 - List Structured File Organizations
 - Multi-List Files
 - Inverted Files
 - Clustered File Organizations
 - Cluster Generation
 - Cluster Definition
 - Cluster Searching
- VOCABULARY CONTROL [GallagherMC]
 - Controlled Vocabularies
 - Pre-Controlled Vocabularies
 - Post-Controlled Vocabularies
 - Free Text Approaches
 - Thesaurus Support
 - Broader Terms
 - Narrower Terms
 - Synonyms
 - Abbreviations
 - Related Terms
- BIBLIOGRAPHIC DATA BASE SEARCHING
 - Types/Levels of Search Languages [SriAR & LiuIH]
 - Procedural, Host-Language-Based Languages
 - Self-Contained, Structured Query Languages
 - Procedure Definition and Invocation Languages
 - Interactive, Prompting-Oriented Languages

O: 01/16/84

R: 02/20/84

- Batch, Forms-Oriented Languages
- Interactive, Forms-Oriented Languages
- List/Menu Selection Languages
- Restricted Natural Languages
- Unrestricted Natural Languages
- Integrated Combinations of the Above
- Search Formulation Features [GranierMR & GallagherMC]
 - Search Field Control
 - Single Term Searching
 - Phrase Searching
 - Term Proximity Searching
 - Term Range Searching
 - Root Searching/Suffix Strip/Prefix Strip Searching
 - Substring Searching
 - Dictionary Searching
 - Thesaurus Searching
 - Relational Operation Usage
 - Logical (Boolean) Operation Usage
 - Request Sets/Search Sets
 - Search Profiles/Saved Search Strategies
 - Search Review
- Output Generation Features [SriAR]
 - Online/Offline Output Generation
 - Pre-Defined Output Formats
 - User-Defined Output Formats
 - Rapid Scan
 - Expanding
 - Highlighting
 - Sorting
 - Ranking
- Instructional/Diagnostic Features [KaviS]
 - Online System Documentation
 - Online Data Base Documentation
 - Online Training
 - Error Diagnostic Facilities
 - Sample Searches
 - Search Logic Tracing

O: 01/16/84
R: 02/20/84

- ADDITIONAL IS&R APPLICATION AREAS [ElMougySA]
 - Selective Dissemination of Information (SDI) Systems and Current Awareness Systems
 - Support For Personal Files
 - Interfaces With Document Delivery Systems
- IS&R PERFORMANCE MEASUREMENT AND EVALUATION
 - Phases of the PME Life Cycle [KaviS]
 - Identification of Generic Evaluation Objectives
 - Identification of Detailed Measurement Parameters
 - Selection of Measurement Mechanisms
 - Identification of Required Data Analyses
 - Design/Conduct of Data Collection Experiments
 - Conduct of Data Analysis / Evaluation Activities
 - Identification of Desired Improvements / Enhancements
 - Implementation of Identified Enhancements
 - Repetition of Cycle as Dictated by Objectives
 - Traditional, Obtrusive User Monitoring [HallPP]
 - Controlled Usage Experiments
 - Use of Human Subjects
 - Subjective User Assessments
 - Recall and Precision Analysis
 - Failure Analysis
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 - Unobtrusive Software Monitoring Facilities
 - System Usage Profile and Data Base Usage Profile Analysis
 - Timing Analysis
 - User Error and Error Recovery Analysis
 - Direct and Surrogate Measures of User Success
 - Automated Statistical Data Analysis
 - Trend Analysis/Projection Analysis

O: 01/16/84
 R: 02/20/84

--- FUTURE INFORMATION STORAGE AND RETRIEVAL SYSTEMS
 [ALL PARTICIPANTS WILL CONTRIBUTE BASED UPON
 FUTURES-ORIENTED ASPECTS WITHIN THEIR INDIVIDUAL
 TOPICAL AREAS]

- Assessment of Current State-of-the-Art
- Identification of Current Research Trends
- Projection of Future System Capabilities

Additionally, visuals will be developed to illustrate
 NASA/RECON examples addressing selected topics from the
 above list.

(7) OTHER COURSE DEVELOPMENT DELIVERABLES.

Selected students will participate in the development of the
 other required course development deliverables. These
 include the following:

- (a) Course Lesson Plans. [KnellerMS & JohnsonA]
- (b) RECON Homework Assignments and Answer Keys. [JohnsonA]
- (c) RECON Usage Assignments and Answer Keys. [HallPP &
 JohnsonA]
- (d) Course Examination(s) and Answer Keys. [HallPP &
 JohnsonA]

(8) RESEARCH-ORIENTED TOPICS: MS & PHD LEVELS.

- (a) Identification of research-oriented topics, including
 both topics directly relevant to the existing contract
 work and topics representing spin-offs of the existing
 contract work. [ANY PARTICIPANT]

MS Theses and Projects currently in progress within
 this context include the following:

- (a1) "Critical Comparative Analysis of the Major
 Commercial IS&R Systems", MS Thesis. [GranierMR]

O: 01/16/84
 R: 02/20/84

- (a2) "Knowledge Based Systems: A Critical Survey of Major Issues and Techniques", MS Thesis. [KaviS]
- (a3) "Natural Language Query System Design", MS Project. [LiulH]
- (a4) "A Thesaurus Sub-System for the MADAM Information Storage and Retrieval System", MS Project. [GallagherMC]
- (a5) "Performance Overhead Cost Measurement and Prediction for Information Systems", MS Project. [YuWC]

- (b) Assist in proposal preparation directed at securing outside funding for the conduct of such research topics. [ANY PARTICIPANT; TASKING WILL BE AS NEEDED]

(9) LONG-RANGE PLAN DEVELOPMENT.

Each student will be expected to provide input into the development of a long-range plan for conducting continued follow-on work after the termination of CMPS669 this semester. Note that this will not require any student commitment to participate in these follow-on activities, merely to assist in identifying the follow-on activities. Examples of follow-on activities would include items such as the following: [ALL PARTICIPANTS]

- (a) Should there be a follow-on CMPS669 offered after the completion of this CMPS669, e.g., in the Summer, 1984? in the Fall, 1984?
- (b) Plan for the completion of MS and PhD research topics as referenced in (8) above.
- (c) Plan for student participation in follow-on contracts.

O: 01/16/84

R: 02/20/84

(10) OTHER CONTRACT RELATED TASKS.

- (a) Coordination of needs analysis questionnaire results, course syllabi, lesson plans, and visuals: [KnellerMS]
- Identification of questionnaire respondents and coordination with questionnaire items.
 - Coordination of questionnaire results with course syllabi.
 - Coordination of questionnaire results with lesson plan format.
 - Development of format for lesson plans.
 - Development of lesson plan standardization requirements.
 - Development of lesson plan "levels of difficulty" ratings.
 - Compilation and coordination of lesson plans into packets.
 - Coordination of lesson plans with visuals/handouts developed by other participants.
- (b) Development of user/system interface for PC equipment to be utilized within the contract work. [HallPP]
- (c) Development of an evaluation methodology for determining the desirability of different course configurations and different PC interface configurations. [HallPP]
- (d) Specification, design, implementation, testing, and operational use of a NASA Multics Workbench to support management control over, and user access to all Multics facilities to be utilized in support of the contract work. [MarmaritsakisS]
- (e) Specification, design, implementation, testing, and operational use of a PC-based simulator of the NASA/RECON system. [PenaCA]

ATTACHMENT 6.5

USL CMPS669 STUDENT TASKS/ASSIGNMENTS

TASKING SPECIFICATIONS DOCUMENT:

SUMMER SEMESTER, 1984

O: 01/16/84
 R: 06/05/84

(4) NASA RECON SYSTEM USAGE.

- (a) Extent of actual hands-on usage by CMPS669 students will depend heavily on on-line system connect time/telephone line charges and budget constraints.
- (b) At a minimum, students will at least make recommendations for content of course usage assignments.
- (c) May have only selected students actually performing the on-line interactive sessions.

(5) COURSE VISUALS DEVELOPMENT.

[TEAM LEADER: GallagherMC;

TEAM MEMBERS: LiuIH, SriAR, BassariJ(support)]

Topic areas will cover all of the areas identified within the CMPS669 syllabus. Activities will focus on reviewing, revising, and coordinating first draft visuals developed during the Spring Semester CMPS669. Topic areas will include, but not necessarily be limited to the following:

--- FEATURE ANALYSIS OF INTERACTIVE INFORMATION STORAGE AND RETRIEVAL SYSTEMS

- User Categorizations
 - System Administrators
 - Data Base Administrators
 - Applications Programmers
 - Information Specialists
 - End Users
 - Parametric Users
- Data Models
 - Hierarchical Data Model
 - Network Data Model
 - Relational Data Model
 - Flat File Model
- Logical Data Structures
 - Item Level
 - Group Level
 - Record Level

O: 01/16/84
 R: 06/05/84

- File Level
- Data Base Level
- Physical Storage Structures
 - Data Representation Considerations
 - Data Characteristics Considerations
 - Device Characteristics Considerations
 - Storage Structuring and Accessing Techniques
- Data Base Definition
 - Data Definition
 - Data Relationships Definition
 - Data Value Integrity Constraints
 - Data Indexing
 - Data Base Definition Languages
- Data Base Interrogation/Searching
 - Basic Selection Constructs
 - Index Searching vs. Data File Searching
 - String Matching Options
 - Existence Checking
 - Compound Conditions
 - Data Base Searching Languages
- Data Base Report Generation
 - Online vs. Offline Report Generation
 - System Default Report Formats
 - User-Defined Report Formats
 - Alternate Output Formats
 - Report Generation Languages
- Data Base Update
 - Update Operations
 - Update Modes
 - Update Data Formats
 - Update History Files
 - Update Utilities
 - Update Access Control
 - Data Base Update Languages
- Data Base Redefinition
 - Logical Data Structure Redefinition
 - Physical Storage Structure Redefinition
 - Redefinition Facilities
 - Data Base Redefinition Languages

O: 01/16/84
 R: 06/05/84

- Administrative Functions
 - System Administrator Functions
 - Data Base Administrator Functions
- Data Base Security Considerations
 - Authentication
 - Authorization
 - Privacy/Security Transformations
 - Security Logging
- Performance Measurement and Evaluation
 - System Execution Efficiency Orientations
 - User Interface/Interaction Orientations
 - PME Tools and Techniques
 - Privacy Considerations
- BIBLIOGRAPHIC DATA BASE DESIGN
 - Bibliographic Data Items/Fields
 - Bibliographic Record Formats
 - Document Files
 - Index Files
 - Thesaurus Files
 - Sample Search Files
 - User Profile Files
- BIBLIOGRAPHIC FILE STRUCTURES
 - Linear File Organizations
 - List Structured File Organizations
 - Multi-List Files
 - Inverted Files
 - Clustered File Organizations
 - Cluster Generation
 - Cluster Definition
 - Cluster Searching
- VOCABULARY CONTROL
 - Controlled Vocabularies
 - Pre-Controlled Vocabularies
 - Post-Controlled Vocabularies

O: 01/16/84
R: 06/05/84

- Free Text Approaches
- Thesaurus Support
 - Broader Terms
 - Narrower Terms
 - Synonyms
 - Abbreviations
 - Related Terms
- BIBLIOGRAPHIC DATA BASE SEARCHING
 - Types/Levels of Search Languages
 - Procedural, Host-Language-Based Languages
 - Self-Contained, Structured Query Languages
 - Procedure Definition and Invocation Languages
 - Interactive, Prompting-Oriented Languages
 - Batch, Forms-Oriented Languages
 - Interactive, Forms-Oriented Languages
 - List/Menu Selection Languages
 - Restricted Natural Languages
 - Unrestricted Natural Languages
 - Integrated Combinations of the Above
 - Search Formulation Features
 - Search Field Control
 - Single Term Searching
 - Phrase Searching
 - Term Proximity Searching
 - Term Range Searching
 - Root Searching/Suffix Strip/Prefix Strip Searching
 - Substring Searching
 - Dictionary Searching
 - Thesaurus Searching
 - Relational Operation Usage
 - Logical (Boolean) Operation Usage
 - Request Sets/Search Sets
 - Search Profiles/Saved Search Strategies
 - Search Review

O: 01/16/84
 R: 06/05/84

- Output Generation Features
 - Online/Offline Output Generation
 - Pre-Defined Output Formats
 - User-Defined Output Formats
 - Rapid Scan
 - Expanding
 - Highlighting
 - Sorting
 - Ranking
- Instructional/Diagnostic Features
 - Online System Documentation
 - Online Data Base Documentation
 - Online Training
 - Error Diagnostic Facilities
 - Sample Searches
 - Search Logic Tracing
- ADDITIONAL IS&R APPLICATION AREAS
 - Selective Dissemination of Information (SDI) Systems and Current Awareness Systems
 - Support For Personal Files
 - Interfaces With Document Delivery Systems
- IS&R PERFORMANCE MEASUREMENT AND EVALUATION
 - Phases of the PME Life Cycle
 - Identification of Generic Evaluation Objectives
 - Identification of Detailed Measurement Parameters
 - Selection of Measurement Mechanisms
 - Identification of Required Data Analyses
 - Design/Conduct of Data Collection Experiments
 - Conduct of Data Analysis / Evaluation Activities
 - Identification of Desired Improvements / Enhancements
 - Implementation of Identified Enhancements
 - Repetition of Cycle as Dictated by Objectives
 - Traditional, Obtrusive User Monitoring
 - Controlled Usage Experiments
 - Use of Human Subjects

O: 01/16/84
 R: 06/05/84

- Subjective User Assessments
- Recall and Precision Analysis
- Failure Analysis
- Data Base Coverage Analysis
- Advanced, Unobtrusive User Monitoring
 - Quasi-Controlled Usage Experiments
 - Unobtrusive Software Monitoring Facilities
 - System Usage Profile and Data Base Usage Profile Analysis
 - Timing Analysis
 - User Error and Error Recovery Analysis
 - Direct and Surrogate Measures of User Success
 - Automated Statistical Data Analysis
 - Trend Analysis/Projection Analysis
- FUTURE INFORMATION STORAGE AND RETRIEVAL SYSTEMS
 [ALL PARTICIPANTS WILL CONTRIBUTE BASED UPON
 FUTURES-ORIENTED ASPECTS WITHIN THEIR INDIVIDUAL
 TOPICAL AREAS]
 - Assessment of Current State-of-the-Art
 - Identification of Current Research Trends
 - Projection of Future System Capabilities

Additionally, visuals will be developed to illustrate NASA/RECON examples addressing selected topics from the above list.

(6) OTHER COURSE DEVELOPMENT DELIVERABLES.

[TEAM LEADER: GranierMR;
 INTERIM TEAM LEADER: GallagherMC;
 TEAM MEMBERS: NamK, KnellerMS, ElMougysA,
 NgSK(support)]

Selected students will participate in the development and/or refinement of the other required course development deliverables based on first drafts developed during the Spring Semester CMPS669.

(a) Course Lesson Plans.[KnellerMS]

(b) RECON Homework Assignments and Answer Keys.[NamK]

O: 01/16/84
 R: 06/05/84

- (c) RECON Usage Assignments and Answer Keys. [NamK]
- (d) Course Examination(s) and Answer Keys. [HallPP]
- (e) Develop Instructor's Manual and explanatory materials for each course sub-section. [ElMougysA, detailed to GallagherMC]
- (f) Coordination of needs analysis questionnaire results, course syllabi, lesson plans, and visuals: [KnellerMS]
 - Identification of questionnaire respondents and coordination with questionnaire items.
 - Coordination of questionnaire results with course syllabi.
 - Coordination of questionnaire results with lesson plan format.
 - Development of format for lesson plans.
 - Development of lesson plan standardization requirements.
 - Development of lesson plan "levels of difficulty" ratings.
 - Compilation and coordination of lesson plans into packets.
 - Coordination of lesson plans with visuals/handouts developed by other participants.

(7) RESEARCH-ORIENTED TOPICS: MS & PHD LEVELS.

- (a) Identification of research-oriented topics, including both topics directly relevant to the existing contract work and topics representing spin-offs of the existing contract work. [ANY PARTICIPANT]

MS Theses and Projects currently in progress within this context include the following:

- (a1) "Critical Comparative Analysis of the Major Commercial IS&R Systems", MS Thesis. [GranierMR]
- (a2) "Knowledge Based Systems: A Critical Survey of Major Issues and Techniques", MS Thesis. [KaviS]

O: 01/16/84
 R: 06/05/84

- (a3) "Natural Language Query System Design", MS Thesis.
 [LiulH]
- (a4) "An Innovative, Multidisciplinary Educational
 Program in Interactive Information Storage and
 Retrieval Systems", MS Thesis. [GallagherMC]
- (a5) "Performance Overhead Cost Measurement and
 Prediction for Information Systems", MS Project.
 [YuWC] (?)
- (b) Assist in proposal preparation directed at securing
 outside funding for the conduct of such research
 topics. [ANY PARTICIPANT; TASKING WILL BE AS NEEDED]

(8) LONG-RANGE PLAN DEVELOPMENT.

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 follow-on work after the termination of CMPS669 this
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 merely to assist in identifying the follow-on activities.
 Examples of follow-on activities would include items such as
 the following: [ALL PARTICIPANTS]

- (a) Should there be a follow-on CMPS669 offered after the
 completion of this CMPS669, e.g., in the Fall, 1984?
- (b) Plan for the completion of MS and PhD research topics
 as referenced in (7) above.
- (c) Plan for student participation in follow-on contracts.

(9) PC-BASED RESEARCH & DEVELOPMENT.

[TEAM LEADERS: HallPP & TriantafyllopoulosS & MoreauDR;
 TEAM MEMBERS: YanL, ChumFY, TangKS(support)]

- (a) Preparation of System Development Standards for systems
 design, programming, testing, and documentation for use
 within a C programming environment on the IBM PC/XT's.

O: 01/16/84
R: 06/05/84

- (b) Development of user/system interface for PC equipment to be utilized within the contract work.
 - (c) Development of an evaluation methodology for determining the desirability of different course configurations and different PC interface configurations.
 - (d) Specification, design, implementation, testing, and operational use of a PC-based simulator of the NASA/RECON system.
- (10) MULTICS-BASED RESEARCH & DEVELOPMENT.
- (a) Enhancements to the specification, design, implementation, testing, and operational use of a NASA Multics Workbench to support management control over, and user access to all Multics facilities to be utilized in support of the contract work.[PenaCA]
- (11) PREPARATION OF FOLLOW-UP CONTRACT PROPOSALS.
[TEAM LEADERS: ChumFY & KaviS & MoreauDR;
TEAM MEMBERS: TangKS(support)]
- (a) Develop PC Simulator Contract Proposal Targeted to Jack Kolb, DoD. [TriantafyllopoulosS]
 - (b) Develop Contract Proposal to Incorporate Additional Systems into the Contract Work: DOE/RECON. [GallagherMC]
 - (c) Develop Contract Proposal to Incorporate Additional Systems into the Contract Work: DOD/DROLS. [NamK]
 - (d) Develop Contract Proposal to Incorporate Additional Systems into the Contract Work: DIALOG. [GranierMR]
 - (e) Develop Contract Proposal to Incorporate Additional Systems into the Contract Work: SDC.
 - (f) Develop Contract Proposal to Incorporate Additional Systems into the Contract Work: BRS.
 - (g) Develop Contract Proposal to Incorporate Additional Systems into the Contract Work: EPA/CSIN. [HallPP]

N A S A

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O: 01/16/84
R: 06/05/84

- (h) Develop Contract Proposal to Incorporate Additional
Systems into the Contract Work: LLL/TIS/IGS. [ChumFY]

T A S K S

- 11 -

ASSIGNMENTS

ATTACHMENT 6.6

**USL DBMS R&D PROJECT NASA/RECON
MULTICS DIRECTORY STURCTURE**

USL DEMS R&D PROJECT: NASA/RECON MULTICS DIRECTORY STRUCTURE

```
>udd>DEMS>NASA/RECON
quota = 1400; used = 841
```

quota	used	directory name
0	131	NASA.MADAM.r&d
0	9	NASA.meeting_notes
0	12	NASA.RA_meeting_notes
0	54	NASA.administration
0	13	NASA.publications
0	119	NASA.working_paper_series
0	4	NASA.CMPS669.student_tasks
0	12	NASA.backup_tapes
0	358	NASA.laser_formats
0	236	NASA.multics_workbench
0	86	NASA.questionnaire
0	83	NASA.course_deliverables
0	43	NASA.proposals
0	8	NASA.PC.r&d
0	1168	Total

```
Segs=0;Msf=0;Dirs=14;Links=0.
```

```
>udd>DEMS>NASA/RECON>NASA.MADAM.r&d
quota = 0; used = 131
```

quota	used	directory name
0	12	DEMS.NASA/RECON.MADAM
0	3	DEMS.NASA/RECON.dil.MADAM
0	10	DEMS.NASA/RECON.til.MADAM
0	3	DEMS.NASA/RECON.com.MADAM
0	4	DEMS.NASA/RECON.bul.MADAM
0	3	DEMS.NASA/RECON.mac.MADAM
0	35	Total

```
Segments = 4, Lengths = 96.
```

```
rew 17 NASA.MADAM_input.PME.input
P
```

```

rew  47  NASA.MADAM_input.IS&R.input
      i
rew  23  NASA.MADAM_input.FME.archive
      p.archive
rew   9  NASA.MADAM_input.RECON.archive
      r.archive

```

Multisegment-files = 6, Lengths = 59.

```

r w    7  DEVS.NASA/RECON.mac.MADAM
r w    8  DEVS.NASA/RECON.bul.MADAM
r w    7  DEVS.NASA/RECON.com.MADAM
r w   14  DEVS.NASA/RECON.til.MADAM
r w    7  DEVS.NASA/RECON.dil.MADAM
r w   16  DEVS.NASA/RECON.MADAM

```

>udd>DEVS>NASA/RECON>NASA.MADAM.r&d>NASA.MADAM_input.FME.archive

name	updated	mode	modified	length
PER	04/23/84 0731.4	r w	04/21/84 0445.5	176283
P	04/23/84 0731.4	r w	04/22/84 0242.3	269235
G	04/23/84 0731.4	r w	04/22/84 0306.7	15003
V	04/23/84 0731.4	r w	04/23/84 0725.0	272907
B	04/23/84 0731.4	r w	04/23/84 0710.5	10368
title	04/29/84 1436.6	r w	04/29/84 0452.3	94212

>udd>DEVS>NASA/RECON>NASA.MADAM.r&d>NASA.MADAM_input.RECON.archive

name	updated	mode	modified	length
inp.1	01/17/84 1106.3	rew	01/17/84 1106.3	11313
inp.2	01/17/84 1409.1	rew	01/17/84 1409.1	7587
inp.3	01/17/84 1410.7	r w	01/17/84 1410.7	6624
inp.4	01/17/84 1117.4	r w	01/17/84 1117.2	8838
inp.5	01/17/84 1122.2	r w	01/17/84 1120.5	2664
inp.6	01/17/84 1125.3	r w	01/17/84 1125.3	4293
inp.7	01/17/84 1129.8	r w	01/17/84 1129.8	3960
inp.8	01/17/84 1411.8	r w	01/17/84 1411.8	12807
inp.9	01/17/84 1413.2	r w	01/17/84 1413.2	9054
inp.10	01/17/84 1141.6	r w	01/17/84 1140.2	3789
inp.11	01/17/84 1150.3	r w	01/17/84 1150.3	7641
inp.12	01/17/84 1153.7	rew	01/17/84 1153.7	5400
inp.13	01/17/84 1155.8	r w	01/17/84 1155.8	6345
inp.14	01/17/84 1156.8	r w	01/17/84 1156.8	5580
inp.15	01/17/84 1157.7	rew	01/17/84 1157.7	5571
inp.16	01/17/84 1414.1	rew	01/17/84 1414.1	7848
inp.17	01/17/84 1414.9	rew	01/17/84 1414.9	12132
inp.18	01/17/84 1416.0	r w	01/17/84 1416.0	9279
inp.19	01/17/84 1418.2	r w	01/17/84 1418.2	14184
inp.20	01/17/84 1210.7	r w	01/17/84 1210.7	8010

inp.21	01/19/84	1456.5	r w	01/19/84	1456.3	3438
inp.22	01/19/84	1456.5	r w	01/19/84	1456.5	5553
inp.23	01/26/84	1751.1	rew	01/26/84	1750.1	5364
inp.24	01/26/84	1805.7	rew	01/26/84	1801.4	4950
inp.25	01/26/84	1813.2	rew	01/26/84	1812.4	5328
inp.26	01/26/84	1824.4	rew	01/26/84	1823.1	4941
inp.27	02/21/84	1904.3	r w	02/17/84	2126.2	5733
inp.28	02/21/84	1904.3	r w	02/21/84	1855.9	6309
inp.29	02/21/84	1904.3	rew	02/21/84	1857.0	4815
inp.30	02/21/84	1904.3	rew	02/21/84	1857.3	4302
inp.31	02/21/84	1904.3	rew	02/21/84	1859.6	4788
inp.32	02/21/84	1904.3	rew	02/21/84	1901.6	4149
inp.33	02/21/84	1904.3	rew	02/21/84	1902.7	3078
inp.34	02/21/84	1904.3	rew	02/17/84	2126.3	3357
inp.35	02/21/84	1904.3	rew	02/17/84	2126.3	3258
inp.36	02/21/84	1904.3	rew	02/17/84	2126.3	3681
inp.37	02/21/84	1904.3	rew	02/17/84	2126.3	4122
inp.38	02/21/84	1904.3	rew	02/21/84	1904.3	3753
inp.39	03/19/84	1334.5	rew	03/19/84	1314.4	5121
inp.40	03/19/84	1334.5	r w	03/19/84	1334.0	6498
inp.41	03/19/84	1247.8	rew	03/19/84	1240.0	3123
inp.42	03/19/84	1247.8	rew	03/19/84	1240.6	3330
inp.43	03/19/84	1247.8	rew	03/14/84	1742.1	4311
inp.44	03/19/84	1247.9	r w	03/19/84	1241.2	4167
inp.45	03/19/84	1247.9	rew	03/14/84	1800.2	3798
inp.46	03/19/84	1247.9	rew	03/19/84	1242.0	4302
inp.47	03/19/84	1247.9	r w	03/19/84	1242.7	3924
inp.48	03/19/84	1247.9	rew	03/19/84	1243.5	3501
inp.49	03/19/84	1248.0	r w	03/19/84	1244.9	4473

>udd>DEMS>NASA/RECON>NASA.meeting_notes
 quota = 0; used = 9

Segments = 1, Lengths = 9.

r w 9 NASA.11/14/83.meeting.archive
 n.archive

>udd>DEMS>NASA/RECON>NASA.meeting_notes>NASA.11/14/83.meeting.archive

name	updated	mode	modified	length
NASA.problems.runoff	01/06/84	1322.3 r w	01/06/84 1321.6	15975
NASA.marketing_plan.runoff	01/06/84	1329.9 r w	01/06/84 1329.0	75798
NASA.3/4_year_plan.runoff	01/06/84	1327.9 r w	01/06/84 1327.7	54270
NASA.course_contents.runoff	01/06/84	1326.0 r w	01/06/84 1325.4	83763
NASA.course_notes.runoff	01/06/84	1339.7 r w	01/06/84 1338.8	21123
NASA.survey_notes.runoff	01/06/84	1335.7 r w	01/06/84 1335.0	10332
NASA.proposals_notes.runoff	01/06/84	1337.7 r w	01/06/84 1336.9	25902
NASA.marketing_notes.runoff	01/06/84	1333.7 r w	01/06/84 1333.3	7659
NASA.1/2_contract_notes.runoff	02/11/84	2350.5 r w	02/11/84 2350.5	5427

```
>udd>DEMS>NASA/RECON>NASA.RA_meeting_notes
quota = 0; used = 12
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Segments = 1, Lengths = 12.

```
rew 12 NASA.RA_meeting_notes.archive
r.archive
```

```
>udd>DEMS>NASA/RECON>NASA.RA_meeting_notes>NASA.RA_meeting_notes.archive
```

name	updated	mode	modified	length
NASA.RA_notes.runoff.ec	04/07/84	0350.9 rew	04/07/84 0350.9	1998
NASA.RA_notes.runoff	04/07/84	0350.9 r w	04/07/84 0350.9	5004
NASA.RA_notes.contents.runoff	04/07/84	0350.9 r w	04/07/84 0350.7	5634
NASA.RA_notes.01/14/84.runoff	02/28/84	1702.1 r w	02/28/84 1701.7	41499
NASA.tasks/status.runoff	06/01/84	1308.1 rew	06/01/84 1308.1	214065
NASA.RA_notes.01/18/84.runoff	02/28/84	1702.1 rew	02/28/84 1701.8	36396
NASA.RA_notes.01/25/84.runoff	02/28/84	1702.1 rew	02/28/84 1701.8	29493
NASA.RA_notes.02/16/84.runoff	02/28/84	1757.2 rew	02/28/84 1756.4	18000
NASA.RA_notes.03/12/84.runoff	04/07/84	0409.3 rew	04/07/84 0409.3	14283
NASA.RA_agenda.05/08/84.runoff	05/09/84	1336.2 r w	05/09/84 1334.9	20394
NASA.RA_notes.05/15/84.runoff	05/21/84	2333.9 rew	05/21/84 2333.9	16839

```
>udd>DEMS>NASA/RECON>NASA.administration
quota = 0; used = 54
```

quota	used	directory name
0	15	NASA.FY83-84.final_report
0	15	Total

Segments = 3, Lengths = 39.

```
r w 1 NASA.RA.mail.ec
r w 1 NASA.RA.mail
r w 37 NASA.administration.archive
a.archive
```

```
>udd>DEMS>NASA/RECON>NASA.administration>NASA.administration.archive
```

name	updated	mode	modified	length
NASA.reading_material.mail	12/22/83	2003.2 r w	12/22/83 2000.0	24345
NASA.WPS.mail.ec	01/21/84	2020.4 r w	01/21/84 2020.4	1854
NASA.WPS.mail.01/21/84	01/21/84	2021.1 r w	01/21/84 2021.1	17928
NASA.workshop_attendees.runoff	02/20/84	1138.9 rew	01/27/84 1647.1	22329
NASA.workshop_evaluation.runoff	02/20/84	1145.1 rew	02/08/84 1543.2	29196
NASA.workshop_summary.runoff	02/20/84	1611.0 rew	02/20/84 1458.7	112212

NASA.REPORT-1.cover_page.runoff	02/28/84	2138.0	r w	02/28/84	1452.9	4851
NASA.REPORT-1.contents.runoff	02/28/84	2138.1	r w	02/28/84	2135.1	45540
NASA.REPORT-1.attachments.runoff	02/29/84	1503.8	rew	02/29/84	1409.0	20070
NASA.workshop_results.archive	02/28/84	2141.3	rew	02/20/84	1144.7	132480
NASA.wps.mail.ec	03/13/84	1635.2	r w	03/13/84	1249.4	2007
NASA.wps.mail	03/13/84	1635.3	r w	03/13/84	1627.7	20439
NASA.GSO.letter.03/26/84.runoff	03/24/84	1417.7	r w	03/24/84	1417.2	15057
NASA.PC.JW_cover_letter.runoff	04/06/84	1731.6	r w	04/06/84	1712.6	75186
NASA.OUTLINES/VISUALS.topics	03/28/84	2258.8	r w	03/28/84	2233.9	4410
NASA.GSO.IHL.letter.runoff	03/29/84	1223.1	r w	03/29/84	1222.5	17676
NASA.GSO.SG.letter.runoff	03/29/84	1211.0	r w	03/29/84	1208.1	17676
NASA.PC_proposal.runoff	04/06/84	1731.6	r w	04/06/84	1705.3	127584
NASA.PC_proposal_two.runoff	03/29/84	1441.1	rew	03/29/84	1435.1	139518
NASA.PC_HP_2600.info.runoff	04/07/84	1113.9	rew	04/07/84	0143.1	14589
NASA.RA_tasks.04/09/84.runoff	04/09/84	1326.5	r w	04/09/84	1315.0	40995
NASA.RA_tasks.04/13/84.runoff	04/13/84	1754.9	r w	04/13/84	1753.6	32769
NASA.GSO.letter.04/16/84.runoff	04/16/84	1012.9	r w	04/16/84	1011.4	15084
NASA.JK.letter.04/16/84.runoff	04/16/84	1035.0	r w	04/16/84	1031.4	12042
NASA.GSO.ARS.letter.runoff	04/23/84	1030.8	r w	04/23/84	1026.5	17190
NASA.GSO.KHN.letter.runoff	04/23/84	1054.0	r w	04/23/84	1052.7	17217
NASA.GSO.ST.letter.runoff	04/23/84	1127.2	r w	04/23/84	1110.5	17586
NASA.GSO.letter.04/26/84.runoff	04/26/84	1311.9	r w	04/26/84	1303.1	17865
NASA.RA.mail.ec	08/03/84	1523.9	r w	08/03/84	1523.9	1575
NASA.RA.mail	07/03/84	1904.4	r w	07/03/84	1858.2	1098
NASA.PC.IBM_letter.runoff	05/02/84	1750.6	r w	05/01/84	1453.5	12582
NASA.installation.ec	05/05/84	1716.4	r w	05/05/84	1639.2	15228
NASA.installation.g.ec	05/05/84	1716.4	r w	05/05/84	1623.6	1719
NASA.installation.u.ec	05/05/84	1716.4	r w	05/05/84	1636.3	1755
NASA.installation.mbx_link.ec	05/05/84	1704.4	r w	05/05/84	1703.5	6885
NASA.installation.RA_acl.ec	06/04/84	1341.4	r w	06/04/84	1228.2	3366
NASA.installation.dbms_pmf	05/05/84	1716.8	r w	05/05/84	1712.3	13347
NASA.installation.personids	06/04/84	1208.8	r w	06/04/84	1208.8	1584
NASA.mail.ec	07/03/84	1904.4	r w	07/03/84	1902.5	2682
NASA.mail	07/03/84	1904.4	r w	07/03/84	1904.0	567
NASA.workbench.mail.ec	05/09/84	1758.1	r w	05/09/84	1758.1	1224
NASA.workbench.mail	05/09/84	1758.6	r w	05/09/84	1757.5	9963
NASA.workstation.05/10/84.runoff	05/10/84	1226.7	r w	05/10/84	1226.7	21627
NASA.summer_participants	06/04/84	1341.4	r w	06/04/84	1239.0	5967
NASA.installation.669_acl.ec	06/04/84	1328.9	r w	06/04/84	1328.6	2313
SU.REPORT-2.cover_page.runoff	06/13/84	1655.4	r w	06/12/84	1217.0	3276
SU.REPORT-2.contents.runoff	06/13/84	1655.4	r w	06/12/84	1508.1	63765
SU.REPORT-2.attachments.runoff	06/18/84	0831.1	rew	06/13/84	1835.3	23265
NASA.PC.PO_IEM_changes.runoff	06/18/84	1030.6	r w	06/18/84	0948.6	15219
NASA.CMPS669.delete_acl.absin	07/31/84	2113.3	r w	07/31/84	2113.3	16992
NASA.RA_tasks.08/04/84	08/13/84	1815.7	r w	08/04/84	1933.5	49050

>udd>DEMS>NASA/RECON>NASA.administration>NASA.FY83-84.final_report
 quota = 0; used = 15

Segments = 3, Lengths = 15.

r w 5 NASA.FINAL.contents.runout
 r w 5 NASA.FINAL.contents.runoff

```

n.runoff
n
r w    5  NASA.FY83-84.finalreport.archive
        r.archive

```

```
>udd>DEMS>NASA/RECON>NASA.administration>NASA.FY83-84.final_report>NASA.FY83-84.finalrep
```

name	updated	mode	modified	length
NASA.FINAL.cover_page.runoff	08/03/84	1520.6 r w	08/03/84 1520.3	0
NASA.FINAL.executive_sum.runoff	08/03/84	1520.6 r w	08/03/84 1520.3	0
NASA.FINAL.contents.runoff	08/13/84	1553.1 r w	08/13/84 1553.1	152118
NASA.FINAL.attachments.runoff	08/03/84	1520.6 r w	08/03/84 1520.3	0

```
>udd>DEMS>NASA/RECON>NASA.publications
quota = 0; used = 13
```

quota	used	directory name
0	9	NASA.publications.pending
0	9	Total

Segments = 1, Lengths = 4.

```

r w    4  NASA.publications.archive
        p.archive

```

```
>udd>DEMS>NASA/RECON>NASA.publications>NASA.publications.archive
```

name	updated	mode	modified	length
NASA.AEDS.abstract.runoff	01/16/84	0931.3 r w	01/16/84 0930.5	19476
NASA.AEDS.foils.runoff	01/27/84	1855.4 r w	01/27/84 1854.2	102024

```
>udd>DEMS>NASA/RECON>NASA.publications>NASA.publications.pending
quota = 0; used = 9
```

Segments = 1, Lengths = 9.

```

r w    9  NASA.HICSS.session.archive
        h.archive

```

```
>udd>DEMS>NASA/RECON>NASA.publications>NASA.publications.pending>NASA.HICSS.session.arch
```

name	updated	mode	modified	length
NASA.HICSS.JW.06/05/84.runoff	06/05/84	1422.6 r w	06/04/84 2041.9	13977
NASA.HICSS.session_tasks.runoff	06/05/84	1422.6 r w	06/04/84 2019.4	9837

NASA.HICSS.participants.runoff	08/03/84	1423.0	r w	08/03/84	1406.6	10062
NASA.HICSS.session_topics.runoff	06/19/84	1004.7	r w	06/07/84	1211.8	3627
NASA.HICSS.deadlines.runoff	07/19/84	0703.1	r w	07/19/84	0703.1	14337
NASA.HICSS.session_theme.runoff	07/29/84	1536.5	r w	07/29/84	1523.3	73917
NASA.HICSS.session_titles.runoff	06/19/84	1438.3	r w	06/19/84	1418.0	1908
NASA.HICSS.invite_letter.runoff	07/19/84	0725.9	r w	07/19/84	0725.9	18117
NASA.HICSS.JK.07/19/84.runoff	07/19/84	0859.1	r w	07/19/84	0730.3	18738
NASA.HICSS.VH.07/19/84.runoff	07/19/84	0859.3	r w	07/19/84	0816.8	19179
NASA.HICSS.RD.07/19/84.runoff	07/19/84	0859.4	r w	07/19/84	0815.4	19062
NASA.HICSS.USL.07/19/84.runoff	07/19/84	0931.2	r w	07/19/84	0924.1	20448
NASA.HICSS.SU.07/19/84.runoff	07/19/84	0931.4	r w	07/19/84	0929.1	19251
NASA.HICSS.CM.07/23/84.runoff	07/23/84	1518.0	r w	07/23/84	1504.9	18819
NASA.HICSS.RD.07/30/84.runoff	07/29/84	1557.5	r w	07/29/84	1554.7	22734
NASA.HICSS.BC.08/03/84.runoff	08/03/84	1423.2	r w	08/03/84	1411.6	18882

>udd>DEMS>NASA/RECON>NASA.working_paper_series
 quota = 0; used = 119

quota	used	directory name
0	0	wps_pending
0	0	wps_review
0	0	Total

Segments = 2, Lengths = 119.

r w 17 NASA.PC_R&D_paper_series.archive
 p.archive
 r w 102 NASA.workin_paper_series.archive
 .w.archive

>udd>DEMS>NASA/RECON>NASA.working_paper_series>NASA.PC_R&D_paper_series.archive

name	updated	mode	modified	length
DEMS.NASA/PC_R&D.runoff.ec	07/07/84	1353.5 r w	07/07/84 1352.8	0
DEMS.NASA/PC_R&D-X.format.runoff	07/07/84	1454.0 r w	07/07/84 1445.2	21888
DEMS.NASA/PC_R&D-1.runoff	07/07/84	1648.7 rew	07/07/84 1646.7	42210
DEMS.NASA/PC_R&D-2.runoff	08/11/84	0938.9 rew	08/11/84 0938.9	56322
DEMS.NASA/PC_R&D-3.runoff	08/01/84	1208.9 rew	08/01/84 1156.1	83178
DEMS.NASA/PC_R&D-4.runoff	08/02/84	1739.9 rew	08/02/84 1735.8	211095
DEMS.NASA/PC_R&D-5.runoff	08/13/84	1322.4 rew	08/06/84 0931.9	116505
DEMS.NASA/PC_R&D-6.runoff	08/02/84	1414.7 r w	08/02/84 1414.4	0
DEMS.NASA/PC_R&D-7.runoff	08/02/84	1715.9 rew	08/02/84 1501.8	70812
DEMS.NASA/PC_R&D-8.runoff	08/02/84	1414.8 r w	08/02/84 1414.4	0

>udd>DEMS>NASA/RECON>NASA.working_paper_series>NASA.workin_paper_series.archive

name	updated	mode	modified	length
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DEMS.NASA/RECON.runoff.ec	01/16/84	0946.5	r w	01/16/84	0946.2	0
DEMS.NASA/RECON-X.rf_params	06/03/84	0221.8	r w	06/03/84	0221.8	2214
DEMS.NASA/RECON-1.archive	06/03/84	0330.9	r w	06/03/84	0330.9	71280
DEMS.NASA/RECON-2.archive	06/03/84	0246.0	r w	06/03/84	0245.0	906768
DEMS.NASA/RECON-3.archive	06/03/84	0310.4	r w	06/03/84	0310.4	144576
DEMS.NASA/RECON-X.cover_page	01/22/84	0444.1	r w	01/22/84	0441.9	18855
DEMS.NASA/RECON.STANDARD.archive	03/31/84	2018.7	rew	03/31/84	2018.7	334584
DEMS.NASA/RECON.STD.runoff.ec	03/31/84	2018.7	rew	03/31/84	2014.8	2025
DEMS.NASA/RECON-4.archive	05/30/84	1100.0	rew	05/29/84	1655.9	762264
DEMS.NASA/RECON-5.archive	06/07/84	1640.7	rew	06/07/84	1438.1	964476
DEMS.NASA/RECON-6.archive	06/07/84	1656.0	rew	06/06/84	1840.3	509508

>udd>DEMS>NASA/RECON>NASA.working_paper_series>wps_pending

quota = 0; used = 0

Directory empty: >udd>DEMS>NASA/RECON>NASA.working_paper_series>wps_pending

>udd>DEMS>NASA/RECON>NASA.working_paper_series>wps_review

quota = 0; used = 0

quota	used	directory name
0	0	pending
0	0	Total

Segs=0;Msf=0;Dirs=1;Links=0.

>udd>DEMS>NASA/RECON>NASA.working_paper_series>wps_review>pending

quota = 0; used = 0

Directory empty: >udd>DEMS>NASA/RECON>NASA.working_paper_series>wps_review>pending

>udd>DEMS>NASA/RECON>NASA.CMPS669.student_tasks

quota = 0; used = 4

Segments = 1, Lengths = 4.

r w	4	NASA.669.student_tasks.archive
		s.archive

>udd>DEMS>NASA/RECON>NASA.CMPS669.student_tasks>NASA.669.student_tasks.archive

name	updated	mode	modified	length
NASA.669.student_tasks.runoff	06/11/84	0854.6 r w	06/07/84	0824.5 132552

>udd>DEMS>NASA/RECON>NASA.backup_tapes

quota = 0; used = 12

Segments = 4, Lengths = 12.

rew	6	tape_3546.map
rew	6	NASA.DEMS_backup_tape.ta
		DEMS.tape_3546.NASA/DEMS_dirs

```

      d.ta
r w    0 NASA.save_backup_tape.ta
      DEMS.tape_3544.NASA_save
      s.ta
r w    0 NASA.CMPS669_backup_tape.ta
      DEMS.tape_3545.NASA/CMPS669_dirs
      c.ta

```

```

>udd>DEMS>NASA/RECON>NASA.laser_formats
quota = 0; used = 358

```

quota	used	directory name
0	2	NASA.laser_copies_required
0	2	Total

Segments = 3, Lengths = 356.

```

r w 109 NASA.laser_formats.archive
      1.archive
r w   1 NASA.laser_formats.1.contents
      1.contents
r w 246 NASA.laser_formats.1.archive
      1.archive

```

```

>udd>DEMS>NASA/RECON>NASA.laser_formats>NASA.laser_formats.1.archive

```

name	updated	mode	modified	length
NASA.AEDS.foils.laser	02/20/84	1136.3 rew	02/10/84 1317.7	100503
NASA.AEDS.foils_4/5.laser	02/20/84	1137.0 rew	02/10/84 1339.3	16560
NASA.workshop_evaluation.laser	02/20/84	1144.8 rew	02/08/84 1628.4	30420
NASA.workshop_summary.laser	02/20/84	1615.2 rew	02/20/84 1614.9	122643
CMPS669.extended_syllabus.laser	02/28/84	1414.2 r w	02/28/84 0903.2	132426
NASA.problems.laser	02/28/84	1414.8 r w	02/28/84 0905.9	19926
NASA.marketing_plan.laser	02/28/84	1414.9 r w	02/28/84 0917.7	96093
NASA.3/4_year_plan.laser	02/28/84	1414.9 r w	02/28/84 0921.3	64935
NASA.course_contents.laser	02/28/84	1415.0 r w	02/28/84 0925.0	109080
NASA.course_notes.laser	02/28/84	1415.6 r w	02/28/84 1115.6	25623
NASA.survey_notes.laser	02/28/84	1415.7 r w	02/28/84 1118.9	12006
NASA.proposals_notes.laser	02/28/84	1415.7 r w	02/28/84 1128.2	32562
NASA.marketing_notes.laser	02/28/84	1415.8 r w	02/28/84 1131.7	8901
NASA.1/2_contract_notes.laser	02/28/84	1415.8 r w	02/28/84 1135.9	6678
NASA.669.student_tasks.laser	02/28/84	1416.4 rew	02/28/84 1145.7	202644
NASA.tasks/status.laser	02/28/84	1416.5 rew	02/28/84 1344.1	245547
DEMS.NASA/RECON.MADAM_database	02/28/84	1417.3 r w	02/28/84 1242.0	284832
DEMS.NASA/RECON-2.laser	02/28/84	1417.6 r w	02/28/84 1227.9	1196559
DEMS.NASA/RECON-3.laser	02/28/84	1417.8 r w	02/28/84 1201.6	210276
NASA.REPORT-1.cover_page.laser	02/29/84	1308.6 r w	02/29/84 1212.0	8775
NASA.REPORT-1.contents.laser	02/29/84	1308.8 r w	02/29/84 0525.5	52344

NASA.REPORT-1.attachments.laser	02/29/84	1502.9	r w	02/29/84	1449.3	32067
DEMS.NASA/RECON-1.laser	02/29/84	1546.6	r w	02/29/84	1519.0	112554
DEMS.NASA/RECON.DEMS_structure	02/29/84	1610.6	r w	02/29/84	1558.2	141840
NASA.questionnaire.JW.laser	03/21/84	1434.1	rew	03/21/84	1312.9	22833
NASA.questionnaire.JWlist.laser	03/21/84	1434.4	rew	03/21/84	1317.1	17118
NASA.questionnaire.cover.laser	03/21/84	1434.9	rew	03/21/84	1305.9	42939
NASA.questionnaire.laser	04/02/84	2050.8	rew	04/02/84	2015.0	98559
NASA.GSO.SG.letter.runout.laser	03/31/84	2043.0	rew	03/29/84	1610.7	19044
NASA.GSO.IHL.letter.runout.laser	03/31/84	2043.2	rew	03/29/84	1609.0	18810
NASA.PC.JW_cover_letter.laser	04/07/84	1115.7	rew	04/07/84	0838.8	83808
NASA.PC_proposal.laser	04/07/84	1115.8	rew	04/07/84	0838.8	157194
DominickWD.1_page_resume.laser	05/23/84	1556.6	rew	05/22/84	1509.2	32886
DominickWD.bio_sketch.laser	05/23/84	1556.7	rew	05/21/84	1618.9	8442
CI.paris_paper.laser	07/11/84	1726.6	rew	07/11/84	1331.3	252540
CI.paris_french_abstract.laser	07/11/84	1727.9	rew	07/11/84	1438.8	32553
NASA.HICSS.session_theme.laser	08/01/84	1533.7	rew	07/30/84	0930.8	82665
NASA.HICSS.deadlines.laser	07/19/84	1110.5	rew	07/19/84	1032.4	19620
DEMS.NASA/RECON.STANDARD.laser	08/01/84	2201.4	rew	08/01/84	2109.4	452187
NASA.669.student_tasks.sum.laser	08/01/84	2204.3	rew	08/01/84	1816.0	215595
DEMS.NASA/RECON-5.laser	08/01/84	2247.7	rew	08/01/84	2109.8	1424826
NASA.document_templates.laser	08/01/84	2308.7	rew	08/01/84	2125.2	69003
NASA.OUTLINES.specs.laser	08/01/84	2310.4	rew	08/01/84	2110.3	89388
NASA.VISUALS.specs.laser	08/01/84	2311.0	rew	08/01/84	2110.3	150264
DEMS.NASA/RECON-4.laser	08/01/84	2312.5	rew	08/01/84	2300.1	1096146
DEMS.NASA/RECON-6.laser	08/01/84	2315.9	rew	08/01/84	2109.8	735129
DEMS.NASA/PC_R&D-2.laser	08/01/84	2317.4	rew	08/01/84	2144.1	88497
DEMS.NASA/PC_R&D-3.laser	08/01/84	2318.0	rew	08/01/84	2144.1	122976
NASA.NASA/RECON.db_status.laser	08/01/84	2319.1	rew	08/01/84	2125.2	407889

>udd>DEMS>NASA/RECON>NASA.laser_formats>NASA.laser_formats.archive

name	updated	mode	modified	length
NASA.university/title_list.laser	08/03/84	1119.7 rew	08/02/84	1824.1 672138
DEMS.NASA/PC_R&D-5.laser	08/03/84	1120.7 rew	08/02/84	1740.0 185652
DEMS.NASA/PC_R&D-7.laser	08/03/84	1121.5 rew	08/02/84	1740.0 108486
NASA.IS&R.db_status.laser	08/03/84	1125.8 rew	08/02/84	1908.0 1969092
NASA.FME.db_status.laser	08/03/84	1125.9 rew	08/02/84	1228.8 685674
DEMS.NASA/PC_R&D-4.laser	08/03/84	1133.4 rew	08/02/84	1903.8 312084
NASA.multics_workbench.laser	08/03/84	1318.7 rew	08/03/84	1254.0 76383

>udd>DEMS>NASA/RECON>NASA.laser_formats>NASA.laser_copies_required
quota = 0; used = 2

Segments = 2, Lengths = 2.

rew 1 laser328.ec
rew 1 laser_ec.archive

>udd>DEMS>NASA/RECON>NASA.laser_formats>NASA.laser_copies_required>laser_ec.archive

name	updated	mode	modified	length
laser_pass2.ec	08/11/84 0745.5	r w	08/01/84 2108.1	3960
laser_prop_spacing.ec	08/11/84 0745.5	rew	08/02/84 1227.9	3960
laser_nrf.ec	08/11/84 0745.5	rew	08/02/84 1818.2	2700
laser328.ec	08/11/84 0745.5	rew	08/11/84 0745.0	3861

>udd>DEMS>NASA/RECON>NASA.multics_workbench
 quota = 0; used = 236

quota	used	directory name
0	8	specifications
0	11	design
0	222	implementation
0	2	testing
0	243	Total

Segments = 1, Lengths = 1.

rew 1 tintegrity_control_file

>udd>DEMS>NASA/RECON>NASA.multics_workbench>specifications
 quota = 0; used = 8

Segments = 5, Lengths = 8.

rew 1 plans.runoff
 rew 2 final_report.runoff
 rew 2 workbench_report.runoff
 rew 1 workbench/status.runoff
 rew 2 NASA.workbench_specs.runoff
 s.runoff

>udd>DEMS>NASA/RECON>NASA.multics_workbench>design
 quota = 0; used = 11

Segments = 4, Lengths = 11.

rew 2 workbench_systems_doc.runoff
 wsd.runoff
 rew 5 Workbench_manual.runoff
 wm.runoff
 rew 2 check_up.info
 r w 2 multics_workbench.report.archive
 d.archive

>udd>DEMS>NASA/RECON>NASA.multics_workbench>design>multics_workbench.report.archive

name	updated	mode	modified	length
------	---------	------	----------	--------

MarmaritsakisS.cover.runoff	05/06/84	0931.1	rew	05/06/84	0324.9	5409
MarmaritsakisS.report.runoff	05/06/84	0931.2	rew	05/06/84	0325.0	19251
workbench.review.05/06/84.runoff	05/06/84	0953.5	r w	05/06/84	0952.5	17352

>udd>DEMS>NASA/RECON>NASA.multics_workbench>implementation
 quota = 0; used = 222

quota	used	directory name
0	61	src_code
0	3	mail_lists
0	2	mail_segments
0	11	std
0	3	NASA/RECON_DOCS
0	3	access_lists
0	83	Total

Segments = 54, Lengths = 148.

rew	1	send_mail.chief.ec
rew	1	send_mail.NASA_RAs.ec
rew	1	create_file
rew	12	outlay_docum
rew	1	compile2.ec
rew	1	compile.ec
rew	1	get_dir_access
rew	1	get_seg_access
rew	2	integrity_control
rew	2	check_seg_attributes
rew	1	enter_exec_mult_com
rew	1	check_pathname
rew	2	integrity_control_functions
rew	2	select_docum
rew	1	combine.ec
rew	1	tasks_init_control
rew	1	integrity_control_file
rew	1	ta_go.absout
rew	1	append_file.ec
rew	1	checkall.list
rew	1	NASA_outlays.runoff
rew	1	NASA_outlays.runout
rew	3	NASA_outlays/status
rew	1	combine_out.ec
rew	1	out_date_change.ec
rew	1	OUT_LEGENDS.runoff
rew	1	header.runout
rew	1	GSO_allocations.runoff
rew	1	add_to_list.ec
rew	1	sdm_base
rew	1	create_list.ec

```

0 NASA/RECON.logmailbox.sv.mbx
0 overdue_docs_mailbox.sv.mbx
rew 12 administrative_functions
rew 1 overdue_docs_mail.ec
rew 1 list_formatter_mail.ec
rew 1 check_up_all.ec
rew 1 check_up_one.ec
rew 1 laser_restore.ec
rew 1 laser_change.ec
rew 1 laser.ec
rew 1 date_change.ec
rew 1 header.runoff
rew 16 NASA.tasks/status
rew 2 LEGENDS.runoff
rew 5 check_up
rew 3 workbench
rew 11 checkout_documents
rew 8 documents_processing
rew 7 mailing_list_formatter
rew 7 mailing_labels_processor
rew 4 tape_backup_procedures
rew 1 exec_mult_com
rew 15 task_docum

```

Multisegment-files = 1, Lengths = 7.

```

r w 7 NASA/RECON_DOCS

```

```

>udd>DEMS>NASA/RECON>NASA.multics_workbench>implementation>src_code
quota = 0; used = 61

```

Segments = 1, Lengths = 75.

```

rew 75 workbench.SUMB4.archive
    wbS.archive

```

```

>udd>DEMS>NASA/RECON>NASA.multics_workbench>implementation>src_code>workbench.SUMB4.arc

```

name	updated	mode	modified	length
mailing_list_formatter.pll	08/10/84	1516.7 rew	08/10/84 1346.9	184527
mailing_labels_processor.pll	08/10/84	1516.7 rew	08/10/84 1345.1	179865
administrative_functions.pll	08/10/84	1516.6 rew	08/10/84 1345.1	339741
checkout_documents.pll	08/10/84	1516.7 rew	08/10/84 1355.1	288891
tape_backup_procedures.pll	08/10/84	1516.7 rew	08/10/84 1345.1	71757
task_docum.pll	08/13/84	1744.8 rew	08/13/84 1739.2	407484
documents_processing.pll	08/10/84	1516.7 rew	08/10/84 1345.1	188568
workbench.pll	08/10/84	1516.8 rew	08/10/84 1356.2	58653
check_up.pll	08/10/84	1516.7 rew	08/10/84 1345.1	193635
exec_mult_com.pll	08/10/84	1516.8 rew	08/10/84 1345.1	10503
outlay_docum.pll	08/14/84	0945.9 rew	08/14/84 0943.6	322425
select_docum.pll	08/10/84	1516.5 rew	08/10/84 1512.7	35703

integrity_control_functions.pl1	08/10/84	1516.6	rew	08/10/84	1452.4	46926
check_pathname.pl1	08/10/84	1516.6	rew	08/10/84	1345.1	8316
enter_exec_mult_com.pl1	08/10/84	1516.6	rew	08/10/84	1345.1	5157
check_seg_attributes.pl1	08/10/84	1516.6	rew	08/10/84	1345.1	58383
create_file.pl1	08/10/84	1516.6	rew	08/10/84	1405.8	10071
integrity_control.pl1	08/10/84	1516.6	rew	08/10/84	1448.0	51318
get_seg_access.pl1	08/10/84	1516.6	rew	08/10/84	1345.1	28737
get_dir_access.pl1	08/10/84	1516.6	rew	08/10/84	1345.1	26577
exist.pl1	08/10/84	1516.7	rew	08/10/84	1413.8	23112
adm_files.pl1	08/10/84	1516.7	rew	08/10/84	1345.1	54009
tests.archive	08/10/84	1556.8	rew	08/10/84	1556.9	105480
save.ec	08/10/84	1557.2	r w	08/10/84	1520.7	6561
list.ec	08/10/84	1558.3	rew	08/01/84	1452.0	5166

>udd>DEMS>NASA/RECON>NASA.multics_workbench>implementation>mail_lists
quota = 0; used = 3

Segments = 3, Lengths = 3.

```
rew    1  Group_1
rew    1  NASA_RAs
rew    1  669_class
```

>udd>DEMS>NASA/RECON>NASA.multics_workbench>implementation>mail_segments
quota = 0; used = 2

Segments = 2, Lengths = 2.

```
rew    1  manual
rew    1  Monday
```

>udd>DEMS>NASA/RECON>NASA.multics_workbench>implementation>std
quota = 0; used = 11

Segments = 3, Lengths = 11.

```
rew    2  OUTLAYS
rew    8  TASKS
rew    1  tasks_init_control
```

>udd>DEMS>NASA/RECON>NASA.multics_workbench>implementation>access_lists
quota = 0; used = 3

Segments = 3, Lengths = 3.

```
rew    1  dir_list
rew    1  test1
rew    1  test
```

>udd>DEMS>NASA/RECON>NASA.multics_workbench>testing
quota = 0; used = 2

quota	used	directory name
-------	------	----------------

0	2	temp
0	1	temp1
0	2	mli
0	5	Total

Segments = 1, Lengths = 2.

```
rew 2 proc_docum.runoff
```

```
>udd>DEMS>NASA/RECON>NASA.multics_workbench>testing>temp
quota = 0; used = 2
```

Segments = 2, Lengths = 2.

```
rew 1 list4
rew 1 list2
```

```
>udd>DEMS>NASA/RECON>NASA.multics_workbench>testing>temp1
quota = 0; used = 1
```

Segments = 1, Lengths = 1.

```
rew 1 xyzzy
```

```
>udd>DEMS>NASA/RECON>NASA.multics_workbench>testing>mli
quota = 0; used = 2
```

Segments = 2, Lengths = 2.

```
rew 1 check
rew 1 test1
```

```
>udd>DEMS>NASA/RECON>NASA.questionnaire
quota = 0; used = 86
```

quota	used	directory name
0	0	questionnaire_pending
0	22	questionnaire_data_analysis
0	22	Total

Segments = 2, Lengths = 64.

```
rew 43 QNAIRE.archive
r w 21 NASA.questionnaire.archive
q.archive
```

>udd>DEMS>NASA/RECON>NASA.questionnaire>NASA.questionnaire.archive

name	updated	mode	modified	length
NASA.questionnaire.JW.runoff	03/21/84 1427.5	r w	03/21/84 1041.1	21015
NASA.questionnaire.cover.runoff	03/21/84 1427.5	r w	03/21/84 1146.9	39249
NASA.questionnaire.runoff	04/02/84 2013.3	r w	04/02/84 2012.8	94086
NASA.questionnaire.JWlist.runoff	03/21/84 1427.5	r w	03/21/84 1215.0	15777
NASA.mailing_labels.archive	04/16/84 0823.1	r w	04/16/84 0111.5	576504

>udd>DEMS>NASA/RECON>NASA.questionnaire>QNAIRE.archive

name	updated	mode	modified	length
data_entry_program.pl1	07/02/84 1908.9	rew	07/02/84 1906.2	171864
post_proc_of_dataentry_prog.pl1	07/02/84 1909.3	rew	07/02/84 1906.2	10260
analysis.spss	07/02/84 1912.3	rew	06/20/84 0205.0	50085
post_proc_spssoutput.pl1	07/02/84 1915.8	rew	07/02/84 1853.3	270225
analysis_main.spss	07/02/84 1918.7	rew	07/02/84 1906.4	38169
summary_of_results	07/02/84 2202.7	rew	07/02/84 2202.7	164718
data_file_or_Q	07/02/84 2203.8	rew	07/02/84 2131.6	160839
comment_file	07/02/84 2206.1	rew	07/02/84 2040.9	249246
SUMMARY.archive	07/20/84 1519.6	r w	07/20/84 1512.2	425844

>udd>DEMS>NASA/RECON>NASA.questionnaire>questionnaire_pending

quota = 0; used = 0

Directory empty: >udd>DEMS>NASA/RECON>NASA.questionnaire>questionnaire_pending

>udd>DEMS>NASA/RECON>NASA.questionnaire>questionnaire_data_analysis

quota = 0; used = 22

quota	used	directory name
0	0	specifications
0	0	data_entry_programs
0	1	spss_programs
0	0	data
0	0	data_analysis_results
0	1	Total

Segments = 5, Lengths = 21.

rew	2	analysis_main.spss
rew	11	data_files.archive
rew	5	data_entry_program.pl1
rew	1	NASA.quest_analysis_tasks.runoff
		t.runoff
		t
rew	2	NASA.questionnaire_specs.runoff
		s.runoff
		s

>udd>DEMS>NASA/RECON>NASA.questionnaire>questionnaire_data_analysis>data_files.archive

name	updated	mode	modified	length
comment_file	05/25/84	0049.0 rew	05/24/84 1722.0	225234
answer_file	05/30/84	1647.0 rew	05/30/84 1642.0	145854

>udd>DEMS>NASA/RECON>NASA.questionnaire>questionnaire_data_analysis>specifications
quota = 0; used = 0

Directory empty: >udd>DEMS>NASA/RECON>NASA.questionnaire>questionnaire_data_analysis>spe

>udd>DEMS>NASA/RECON>NASA.questionnaire>questionnaire_data_analysis>data_entry_programs
quota = 0; used = 0

Directory empty: >udd>DEMS>NASA/RECON>NASA.questionnaire>questionnaire_data_analysis>dat

>udd>DEMS>NASA/RECON>NASA.questionnaire>questionnaire_data_analysis>spss_programs
quota = 0; used = 1

Segments = 1, Lengths = 1.

rew 1 example1.spss

>udd>DEMS>NASA/RECON>NASA.questionnaire>questionnaire_data_analysis>data
quota = 0; used = 0

Directory empty: >udd>DEMS>NASA/RECON>NASA.questionnaire>questionnaire_data_analysis>dat

>udd>DEMS>NASA/RECON>NASA.questionnaire>questionnaire_data_analysis>data_analysis_result
quota = 0; used = 0

Directory empty: >udd>DEMS>NASA/RECON>NASA.questionnaire>questionnaire_data_analysis>dat

>udd>DEMS>NASA/RECON>NASA.course_deliverables
quota = 0; used = 83

quota	used	directory name
0	8	standards
0	0	syllabi
0	15	visuals_outlines
0	114	visuals
0	44	lesson_plans
0	30	homework_assignments
0	18	usage_assignments
0	0	examinations
0	93	instructor_notes
0	322	Total

Segs=0;Msfs=0;Dir=9;Links=0.

>udd>DEMS>NASA/RECON>NASA.course_deliverables>standards
quota = 0; used = 8

Segments = 1, Lengths = 8.

r w 8 NASA.course.standards.archive

s.archive

>udd>DEMS>NASA/RECON>NASA.course_deliverables>standards>NASA.course.standards.archive

name	updated	mode	modified	length
NASA.OUTLINES.specs.runoff	08/01/84	1912.2 rew	08/01/84 1909.5	56943
NASA.VISUALS.specs.runoff	08/01/84	1931.5 rew	08/01/84 1930.3	105057
NASA.OUTLINES.reviewing.runoff	04/06/84	2043.8 rew	04/06/84 2043.8	61317
NASA.document_templates.runoff	08/01/84	1706.3 r w	08/01/84 1703.8	56250

>udd>DEMS>NASA/RECON>NASA.course_deliverables>syllabi

quota = 0; used = 0

Directory empty: >udd>DEMS>NASA/RECON>NASA.course_deliverables>syllabi

>udd>DEMS>NASA/RECON>NASA.course_deliverables>visuals_outlines

quota = 0; used = 15

Segments = 4, Lengths = 15.

rew	1	NASA.SUMMER.OUTLINES.runoff
rew	7	NASA.SUMMER.OUTLINES.archive
		so.archive
rew	1	NASA.SUMMER.OUTLINES.runoff.ec
r w	6	NASA.COURSE.OUTLINES.archive
		o.archive

>udd>DEMS>NASA/RECON>NASA.course_deliverables>visuals_outlines>NASA.COURSE.OUTLINES.archive

name	updated	mode	modified	length
NASA.OUTLINES.runoff.ec	05/18/84	1228.0 rew	05/18/84 1228.0	1458
NASA.OUTLINES.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	10404
NASA.O.FEATURE_ANALYSIS.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	792
NASA.O.user_categories.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	4590
NASA.O.data_models.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	2034
NASA.O.logical.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	2925
NASA.O.physical.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	5481
NASA.O.db_definition.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	2466
NASA.O.db_interrogation.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	7182
NASA.O.db_report_gen.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	3096
NASA.O.db_update.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	1899
NASA.O.db_redefinition.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	1962
NASA.O.administration.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	2718
NASA.O.db_security.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	3915
NASA.O.pme_overview.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	6480
NASA.O.BIB_DB_DESIGN.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	477
NASA.O.bib_db_design.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	2916
NASA.O.BIB_FILE_STRUCTURE.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	459
NASA.O.linear.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	1818
NASA.O.list_structured.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	2430
NASA.O.clustered.runoff	05/09/84	1416.9 rew	05/09/84 1416.9	2637

NASA.O.VOCABULARY_CONTROL.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	369
NASA.O.controlled.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	1827
NASA.O.free_text.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	1341
NASA.O.thesaurus.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	4050
NASA.O.BIB_SEARCHING.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	504
NASA.O.language_types.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	9009
NASA.O.search_formulation.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	20538
NASA.O.output_generation.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	4707
NASA.O.instruction.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	7137
NASA.O.APPLICATION_AREAS.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	504
NASA.O.sdi.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	3708
NASA.O.personal_files.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	2241
NASA.O.document_delivery.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	1917
NASA.O.IS&R_FME.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	594
NASA.O.pme_life_cycle.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	13590
NASA.O.obtrusive.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	9153
NASA.O.unobtrusive.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	12474
NASA.O.FUTURES.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	1962

>udd>DEMS>NASA/RECON>NASA.course_deliverables>visuals_outlines>NASA.SUMMER.OUTLINES.arch

name	updated	mode	modified	length
NASA.OUTLINES.runoff.ec	08/05/84	1742.8	rew	08/05/84 1641.3 1404
NASA.OUTLINES.runoff	08/05/84	1742.8	rew	08/05/84 1637.5 12906
NASA.O.FEATURE_ANALYSIS.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 792
NASA.O.user_categories.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 4590
NASA.O.data_models.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 2034
NASA.O.logical.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 2925
NASA.O.physical.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 5481
NASA.O.db_definition.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 2466
NASA.O.db_interrogation.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 7182
NASA.O.db_report_gen.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 3096
NASA.O.db_update.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 1899
NASA.O.db_redefinition.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 1962
NASA.O.administration.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 2718
NASA.O.db_security.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 3915
NASA.O.pme_overview.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 6480
NASA.O.BIB_DB_DESIGN.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 477
NASA.O.bib_db_design.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 2916
NASA.O.BIB_FILE_STRUCTURE.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 459
NASA.O.linear.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 1818
NASA.O.list_structured.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 2430
NASA.O.clustered.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 2637
NASA.O.VOCABULARY_CONTROL.runoff	07/18/84	1419.4	rew	07/18/84 1150.4 369
NASA.O.controlled.runoff	07/18/84	1419.4	rew	07/18/84 1150.3 1827
NASA.O.free_text.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 1341
NASA.O.thesaurus.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 4050
NASA.O.BIB_SEARCHING.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 504
NASA.O.language_types.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 9009
NASA.O.search_formulation.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 20538
NASA.O.output_generation.runoff	05/09/84	1416.9	rew	05/09/84 1416.9 4707

NASA.O.instruction.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	7137
NASA.O.APPLICATION_AREAS.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	504
NASA.O.sdi.runoff	07/30/84	1123.4	r w	07/30/84	1107.2	2952
NASA.O.personal_files.runoff	07/30/84	1123.4	r w	07/30/84	1110.0	2385
NASA.O.document_delivery.runoff	07/30/84	1123.4	r w	07/30/84	1122.3	2700
NASA.O.IS&R_PME.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	594
NASA.O.pme_life_cycle.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	13590
NASA.O.obtrusive.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	9153
NASA.O.unobtrusive.runoff	05/09/84	1416.9	rew	05/09/84	1416.9	12474
NASA.O.FUTURES.runoff	08/05/84	1742.8	rew	08/05/84	1742.8	639
NASA.O.INTRODUCTION.runoff	07/18/84	1424.9	rew	07/18/84	1154.0	279
NASA.O.conventional.runoff	07/18/84	1424.9	rew	07/18/84	1157.0	1269
NASA.O.comb_ret.runoff	07/30/84	1124.1	r w	07/30/84	1113.2	2016
NASA.O.personal.runoff	07/30/84	1124.1	r w	07/30/84	1116.1	2484
NASA.O.fut_lang.runoff	08/05/84	1652.8	r w	08/05/84	1642.4	1566
NASA.O.alt_user.runoff	08/05/84	1652.8	r w	08/05/84	1645.1	1566
NASA.O.PC_env.runoff	08/05/84	1652.8	r w	08/05/84	1649.1	1575
NASA.O.KBS.runoff	08/05/84	1652.8	r w	08/05/84	1652.3	3078
NASA.O.distributed.runoff	08/05/84	1652.8	r w	08/05/84	1652.8	1782
NASA.SUMMER.OUTLINES.runoff	08/14/84	0904.4	rew	08/14/84	0904.4	12942
NASA.SUMMER.OUTLINES.runoff.ec	08/11/84	0900.4	rew	08/11/84	0900.5	1710
NASA.O.introduction.runoff	08/13/84	1049.8	r w	08/13/84	1049.8	4059
NASA.O.RESEARCH_METHODS.runoff	08/14/84	0910.5	r w	08/14/84	0910.5	1440

>udd>DEMS>NASA/RECON>NASA.course_deliverables>visuals
 quota = 0; used = 114

Segments = 7, Lengths = 114.

rew	3	NASA.HD.db_report_gen.runoff
rew	2	NASA.HD.introduction.runoff
rew	1	NASA.SUMMER.runoff
rew	1	NASA.SUMMER.runoff.ec
rew	8	NASA.HANDOUTS.archive
rew	51	NASA.SUMMER.VISUALS.archive
		sv.archive
r w	48	NASA.COURSE.VISUALS.archive
		v.archive

>udd>DEMS>NASA/RECON>NASA.course_deliverables>visuals>NASA.COURSE.VISUALS.archive

name	updated	mode	modified	length
NASA.VISUALS.runoff.ec	05/14/84	1825.2 rew	05/11/84 1223.7	1260
NASA.VISUALS.runoff	05/09/84	1427.4 rew	05/09/84 1427.4	10404
NASA.V.FEATURE_ANALYSIS.runoff	05/21/84	1241.4 rew	05/21/84 1241.4	3123
NASA.V.user_categories.runoff	05/11/84	1027.8 rew	05/11/84 1027.8	41490
NASA.V.data_models.runoff	05/09/84	1427.4 rew	05/09/84 1427.4	91611
NASA.V.logical.runoff	05/09/84	1427.4 rew	05/09/84 1427.4	38295
NASA.V.physical.runoff	05/09/84	1427.4 rew	05/09/84 1427.4	67185
NASA.V.db_definition.runoff	05/09/84	1427.4 rew	05/09/84 1427.4	39528
NASA.V.db_interrogation.runoff	05/11/84	1129.9 rew	05/11/84 1129.9	173421

NASA.V.db_report_gen.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	50067
NASA.V.db_update.runoff	05/11/84	1133.2	rew	05/11/84	1133.2	20106
NASA.V.db_redefinition.runoff	05/11/84	1142.2	rew	05/11/84	1137.3	12204
NASA.V.administration.runoff	05/11/84	1142.2	rew	05/11/84	1138.5	18180
NASA.V.db_security.runoff	05/11/84	1142.2	rew	05/11/84	1139.8	40446
NASA.V.pme_overview.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	62757
NASA.V.BIB_DB_DESIGN.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	4905
NASA.V.bib_db_design.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	58959
NASA.V.BIB_FILE_STRUCTURE.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	5526
NASA.V.linear.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	21789
NASA.V.list_structured.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	33930
NASA.V.clustering.runoff	05/14/84	1825.2	rew	05/14/84	1825.2	53613
NASA.V.VOCABULARY_CONTROL.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	3600
NASA.V.controlled.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	29835
NASA.V.free_text.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	10188
NASA.V.thesaurus.runoff	05/11/84	1156.3	rew	05/11/84	1153.1	40257
NASA.V.BIB_SEARCHING.runoff	05/21/84	1246.5	rew	05/21/84	1246.2	2187
NASA.V.language_types.runoff	05/11/84	1206.2	rew	05/11/84	1203.5	254601
NASA.V.search_formulation.runoff	05/11/84	1206.2	rew	05/11/84	1204.6	147762
NASA.V.output_generation.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	87273
NASA.V.instruction.runoff	05/11/84	1206.2	rew	05/11/84	1206.2	16614
NASA.V.APPLICATION_AREAS.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	3762
NASA.V.sdi.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	7074
NASA.V.personal_files.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	4455
NASA.V.document_delivery.runoff	05/11/84	1211.0	rew	05/11/84	1209.3	5004
NASA.V.IS&R_PME.runoff	05/21/84	1251.5	rew	05/21/84	1251.5	2853
NASA.V.pme_life_cycle.runoff	05/18/84	1245.2	rew	05/18/84	1245.0	122409
NASA.V.obtrusive.runoff	05/11/84	1211.0	rew	05/11/84	1210.6	52614
NASA.V.unobtrusive.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	74376
NASA.V.FUTURES.runoff	05/21/84	1638.4	rew	05/21/84	1638.5	2961
NASA.V.system_example.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	360
NASA.V.discipl_example.runoff	05/09/84	1427.4	rew	05/09/84	1427.4	396

>udd>DEMS>NASA/RECON>NASA.course_deliverables>visuals>NASA.HANDOUTS.archive

name	updated	mode	modified	length
systems_handout.runoff	08/12/84	0821.7 r w	08/12/84 0821.7	29538
MADAM.pre_usage_questionnaire	08/12/84	0821.7 rew	08/12/84 0821.7	30771
MADAM.post_usage_questionnaire	08/12/84	0821.7 rew	08/12/84 0821.8	57456
intro_handout.runoff	08/12/84	0821.7 r w	08/10/84 1008.7	25551
NASA.HD.intro_visual.runoff	08/13/84	1004.4 r w	08/13/84 0955.2	25551
NASA.HD.pme_overview_pre	08/13/84	1004.4 rew	08/13/84 0955.2	30771
NASA.HD.pme_overview_post	08/13/84	1004.4 rew	08/13/84 0955.2	57456
NASA.HD.interrogation.runoff	08/13/84	1004.4 r w	08/13/84 0955.2	29538

>udd>DEMS>NASA/RECON>NASA.course_deliverables>visuals>NASA.SUMMER.VISUALS.archive

name	updated	mode	modified	length
NASA.V.FEATURE_ANALYSIS.runoff	08/10/84	1446.8 rew	08/10/84 1446.8	3159

NASA.V.user_categories.runoff	08/10/84	1451.2	rew	08/10/84	1451.2	35982
NASA.V.data_models.runoff	08/10/84	1501.8	rew	08/10/84	1501.8	54468
NASA.V.logical.runoff	08/10/84	1505.7	rew	08/10/84	1505.7	21834
NASA.V.physical.runoff	08/10/84	1511.4	rew	08/10/84	1511.4	35478
NASA.V.db_definition.runoff	08/13/84	1154.6	rew	08/13/84	1154.6	15750
NASA.V.db_interrogation.runoff	08/13/84	1158.0	rew	08/13/84	1158.0	139311
NASA.V.db_report_gen.runoff	08/10/84	1645.6	rew	08/10/84	1645.6	58914
NASA.V.db_update.runoff	08/10/84	1633.0	rew	08/10/84	1633.0	24075
NASA.V.db_redefinition.runoff	07/02/84	1055.2	rew	07/02/84	1055.0	13383
NASA.V.administration.runoff	08/10/84	2048.0	rew	08/10/84	2048.0	15102
NASA.V.db_security.runoff	08/10/84	2044.9	rew	08/10/84	2044.9	36036
NASA.V.pme_overview.runoff	08/10/84	2143.3	rew	08/10/84	2143.3	55737
NASA.V.BIB_DB_DESIGN.runoff	07/02/84	1055.2	rew	07/02/84	1055.0	4905
NASA.V.bib_db_design.runoff	08/10/84	2225.9	rew	08/10/84	2225.9	51057
NASA.V.BIB_FILE_STRUCTURE.runoff	07/02/84	1055.2	rew	07/02/84	1055.0	5526
NASA.V.linear.runoff	08/14/84	0852.6	rew	08/14/84	0852.6	22419
NASA.V.list_structured.runoff	08/11/84	0919.3	rew	08/11/84	0919.3	27549
NASA.V.clustered.runoff	08/06/84	1232.6	rew	07/31/84	1959.3	26946
NASA.V.VOCABULARY_CONTROL.runoff	07/20/84	1345.7	rew	07/19/84	1140.7	3600
NASA.V.controlled.runoff	08/11/84	0938.5	rew	08/11/84	0938.5	33570
NASA.V.free_text.runoff	08/11/84	0942.1	rew	08/11/84	0942.1	12015
NASA.V.thesaurus.runoff	08/11/84	0952.4	r w	08/11/84	0952.4	40113
NASA.V.BIB_SEARCHING.runoff	08/11/84	1759.8	rew	08/11/84	1759.8	2259
NASA.V.language_types.runoff	08/12/84	0903.4	rew	08/12/84	0903.4	172134
NASA.V.search_fomulation.runoff	08/12/84	1650.1	r w	08/12/84	1650.1	137223
NASA.V.output_generation.runoff	08/11/84	0958.1	rew	08/11/84	0958.1	94932
NASA.V.instruction.runoff	08/11/84	1022.9	rew	08/11/84	1022.9	37971
NASA.V.APPLICATION_AREAS.runoff	08/14/84	0858.5	rew	08/14/84	0858.5	4401
NASA.V.sdi.runoff	08/11/84	1045.9	rew	08/11/84	1045.9	14823
NASA.V.personal_files.runoff	08/11/84	1049.3	rew	08/11/84	1049.3	17397
NASA.V.document_delivery.runoff	08/11/84	1054.8	rew	08/11/84	1054.8	12699
NASA.V.IS&R_PME.runoff	08/11/84	1121.5	rew	08/11/84	1121.5	2952
NASA.V.pme_life_cycle.runoff	08/11/84	1241.4	rew	08/11/84	1241.4	91368
NASA.V.obtrusive.runoff	08/11/84	1225.3	rew	08/11/84	1225.3	61326
NASA.V.unobtrusive.runoff	08/14/84	0902.6	rew	08/14/84	0902.6	92340
NASA.V.FUTURES.runoff	08/11/84	1647.5	rew	08/11/84	1647.5	3060
NASA.V.system_example.runoff	08/06/84	1240.2	rew	07/25/84	1312.8	360
NASA.V.discipl_example.runoff	08/06/84	1240.2	rew	07/25/84	1312.1	396
NASA.V.futures.runoff	07/21/84	1031.3	rew	07/21/84	1031.3	108540
NASA.V.conventional.runoff	08/10/84	0925.6	rew	08/10/84	0925.7	35064
NASA.V.fut_lang.runoff	08/11/84	1752.7	re	08/11/84	1752.7	28701
NASA.V.alt_user.runoff	08/11/84	1721.0	re	08/11/84	1721.0	24390
NASA.V.PC_env.runoff	08/11/84	1728.0	r w	08/11/84	1728.0	14940
NASA.V.KBS.runoff	08/11/84	1735.6	r w	08/11/84	1735.6	23130
NASA.V.distributed.runoff	08/11/84	1741.3	r w	08/11/84	1741.3	13554
NASA.V.personal.runoff	08/11/84	1110.8	rew	08/11/84	1110.8	12816
NASA.V.comb_ret.runoff	08/11/84	1101.6	rew	08/11/84	1101.6	11061
NASA.SUMMER.runoff.ec	08/12/84	1049.4	r w	08/12/84	1049.4	1314
NASA.SUMMER.runoff	08/14/84	0849.9	r w	08/14/84	0849.9	13248
NASA.V.introduction.runoff	08/13/84	1058.3	rew	08/13/84	1058.1	37368
NASA.V.COURSE_OVERVIEW.runoff	08/14/84	0848.6	r w	08/14/84	0848.6	5139
NASA.V.RESEARCH_METHODS.runoff	08/14/84	0846.2	r w	08/14/84	0846.2	2592

```
>udd>DEMS>NASA/RECON>NASA.course_deliverables>lesson_plans
quota = 0; used = 44
```

```
Segments = 5, Lengths = 44.
```

```
rew    1  suzy.runout
rew    1  suzy.runoff
rew    1  lesson_plans_header.runoff
rew   22  lesson_plans.runout
rew   19  NASA.COURSE.LESSON_PLANS.archive
        1.archive
```

```
>udd>DEMS>NASA/RECON>NASA.course_deliverables>lesson_plans>NASA.COURSE.LESSON_PLANS.arch
```

name	updated	mode	modified	length
lesson_plans.runoff	05/07/84 1645.3	rew	05/07/84 1639.3	8433
lesson_plans_header.runoff	05/07/84 1645.3	rew	05/07/84 1639.3	23958
lesson_plans_1.runoff	05/07/84 2045.4	rew	05/07/84 1923.5	11673
lesson_plans_2.runoff	05/07/84 2045.4	rew	05/07/84 1925.4	11097
lesson_plans_3.runoff	05/07/84 2045.4	rew	05/07/84 1929.2	12978
lesson_plans_4.runoff	05/07/84 2045.4	rew	05/07/84 1931.3	11727
lesson_plans_5.runoff	05/07/84 2045.4	rew	05/07/84 1936.5	12303
lesson_plans_6.runoff	05/07/84 2045.4	rew	05/07/84 1939.9	12366
lesson_plans_7.runoff	05/07/84 2045.4	rew	05/07/84 1954.0	12042
lesson_plans_8.runoff	05/07/84 2045.4	rew	05/07/84 2010.3	12672
lesson_plans_9.runoff	05/07/84 2045.4	rew	05/07/84 2009.8	13734
lesson_plans_10.runoff	05/07/84 2045.4	rew	05/07/84 2013.8	9945
lesson_plans_11.runoff	05/07/84 2045.4	rew	05/07/84 2016.5	10944
lesson_plans_12.runoff	05/07/84 2045.4	rew	05/07/84 2019.4	10611
lesson_plans_13A.runoff	05/07/84 1905.4	rew	05/07/84 1836.6	9441
lesson_plans_13B.runoff	05/07/84 2045.4	rew	05/07/84 2022.4	11781
lesson_plans_14.runoff	05/07/84 2045.4	rew	05/07/84 2024.8	13284
lesson_plans_15.runoff	05/07/84 2045.4	rew	05/07/84 2030.3	14013
lesson_plans_16.runoff	05/07/84 1725.9	rew	05/07/84 1725.6	12654
lesson_plans_17.runoff	05/07/84 2045.4	rew	05/07/84 2035.2	12141
lesson_plans_18.runoff	05/07/84 2045.4	rew	05/07/84 2040.0	11151
lesson_plans_19.runoff	05/07/84 2045.4	rew	05/07/84 2043.9	13221
lesson_plans_20.runoff	05/07/84 2045.4	rew	05/07/84 2045.4	11313
lesson_plans_21.runoff	05/07/84 2116.7	rew	05/07/84 2051.0	15993
lesson_plans_22.runoff	05/07/84 2116.7	rew	05/07/84 2053.7	13257
lesson_plans_23.runoff	05/07/84 2116.7	rew	05/07/84 2057.4	15462
lesson_plans_24.runoff	05/07/84 2116.7	rew	05/07/84 2100.5	14580
lesson_plans_25.runoff	05/07/84 2116.7	rew	05/07/84 2104.4	17541
lesson_plans_26.runoff	05/07/84 2116.7	rew	05/07/84 2107.5	16803
lesson_plans_27.runoff	05/07/84 2205.0	rew	05/07/84 2201.1	14247
lesson_plans_28.runoff	05/07/84 2205.0	rew	05/07/84 2200.8	13014
lesson_plans_29.runoff	05/07/84 2205.0	rew	05/07/84 2200.8	14931
lesson_plans_30.runoff	05/07/84 2205.0	rew	05/07/84 2200.8	13752
lesson_plans_31.runoff	05/07/84 2205.0	rew	05/07/84 2200.8	15615
lesson_plans_32.runoff	05/07/84 2205.0	rew	05/07/84 2200.8	13500
lesson_plans_33.runoff	05/07/84 2205.0	rew	05/07/84 2200.7	12393

lesson_plans_34.runoff	05/07/84	2205.0	rew	05/07/84	2200.7	13131
lesson_plans_35.runoff	05/07/84	2205.0	rew	05/07/84	2200.7	17955
lesson_plans_36.runoff	05/07/84	2205.0	rew	05/07/84	2200.7	16110
lesson_plans_37.runoff	05/07/84	2205.0	rew	05/07/84	2200.7	13104
lesson_plans_38.runoff	05/07/84	2205.0	rew	05/07/84	2200.7	11610
lesson_plans_39.runoff	05/07/84	2205.0	rew	05/07/84	2200.7	13896
lesson_plans_40.runoff	05/07/84	2205.0	rew	05/07/84	2200.7	13770
lesson_plans_41.runoff	05/07/84	2205.0	rew	05/07/84	2200.7	13518
lesson_plans_42.runoff	05/07/84	2205.0	rew	05/07/84	2200.0	13374
lesson_plans_43.runoff	05/07/84	2205.0	rew	05/07/84	2159.7	13779
lesson_plans_44.runoff	05/07/84	2205.0	rew	05/07/84	2159.7	13230
lesson_plans_48.runoff	05/07/84	2205.0	rew	05/07/84	2156.5	8604

>udd>DEMS>NASA/RECON>NASA.course_deliverables>homework_assignments
 quota = 0; used = 30

Segments = 5, Lengths = 30.

rew	1	TEST1.runoff
rew	3	q.new.runoff
rew	7	NamK.archive
rew	11	homework.archive
rew	8	NASA.COURSE.HOMEWORK.archive

>udd>DEMS>NASA/RECON>NASA.course_deliverables>homework_assignments>NASA.COURSE.HOMEWORK.

name	updated	mode	modified	length
homework_1.runoff	05/07/84	1308.7 r w	05/07/84 1044.9	17478
homework_2.runoff	05/07/84	1308.7 r w	05/07/84 0906.2	17010
homework_3.runoff	05/07/84	0831.1 r w	05/07/84 0829.7	9333
solution_hw_1.runoff	05/07/84	1308.7 r w	05/07/84 1035.9	75411
homework_4.runoff	05/07/84	1308.7 r w	05/07/84 1229.0	11898
homework_5.runoff	05/07/84	1308.7 r w	05/07/84 0910.7	7560
solution_hw_2.runoff	05/07/84	1308.7 r w	05/07/84 1116.9	21456
solution_hw_3.runoff	05/07/84	1308.7 r w	05/07/84 1149.0	45477
solution_hw_4.runoff	05/07/84	1308.7 r w	05/07/84 1228.0	29529
solution_hw_5.runoff	05/07/84	1308.7 r w	05/07/84 1307.2	21933
homework.runoff	05/07/84	1502.0 rew	05/07/84 1501.9	1809

>udd>DEMS>NASA/RECON>NASA.course_deliverables>homework_assignments>NamK.archive

name	updated	mode	modified	length
usage_key.runoff	08/06/84	1329.3 rew	07/27/84 0939.6	135810
usage.runoff	08/06/84	1329.8 rew	07/26/84 1637.1	55845
NASA_usage.runoff	08/06/84	1330.1 rew	07/20/84 0117.4	26793

>udd>DEMS>NASA/RECON>NASA.course_deliverables>homework_assignments>homework.archive

name	updated	mode	modified	length
q1.runoff	08/14/84 1110.8	rew	08/14/84 1110.8	213129
q2.runoff	08/14/84 0836.9	rew	08/14/84 0836.9	104193
q3.runoff	08/14/84 0839.8	rew	08/14/84 0745.0	68139
q.standards.runoff	08/14/84 0838.8	rew	08/14/84 0745.0	9522

>add>DEMS>NASA/RECON>NASA.course_deliverables>usage_assignments
 quota = 0; used = 18

Segments = 5, Lengths = 18.

```
rew 1 NASA_usage.runoff
rew 2 usage.runoff
rew 4 usage_key.runoff
rew 7 NanK.archive
rew 4 \ NASA.COURSE.USAGE_ASSTS.runoff
    ua.runoff
    Spring_84.ua.runoff
```

>add>DEMS>NASA/RECON>NASA.course_deliverables>usage_assignments>NanK.archive

name	updated	mode	modified	length
usage_key.runoff	08/06/84 1329.3	rew	07/27/84 0939.6	135810
usage.runoff	08/06/84 1329.8	rew	07/26/84 1637.1	55845
NASA_usage.runoff	08/06/84 1330.1	rew	07/20/84 0117.4	26793

>add>DEMS>NASA/RECON>NASA.course_deliverables>examinations

quota = 0; used = 0

Directory empty: >add>DEMS>NASA/RECON>NASA.course_deliverables>examinations

>add>DEMS>NASA/RECON>NASA.course_deliverables>instructor_notes

quota = 0; used = 93

Segments = 8, Lengths = 89.

```
rew 6 NASA.I.search_formulation.runoff
rew 4 NASA.I.data_models.runoff
rew 1 NASA.V.discipl_example.runoff
rew 1 NASA.V.system_example.runoff
rew 1 NASA.INSTRUCTOR.runoff.ec
rew 1 NASA.INSTRUCTOR.runoff
rew 1 i.standards.runoff
rew 74 NASA.COURSE.INST_MANUAL.archive
    INST.archive
```

>add>DEMS>NASA/RECON>NASA.course_deliverables>instructor_notes>NASA.COURSE.INST_MANUAL.a

name	updated	mode	modified	length
NASA.VISUALS.runoff.ec	08/07/84 1529.9	rew	08/07/84 0949.0	1323

NASA.VISUALS.runoff	08/07/84	1530.3	rew	08/07/84	0949.0	10935
NASA.I.conventional.runoff	08/07/84	1530.5	rew	08/07/84	1530.5	41022
NASA.I.introduction.runoff	08/13/84	0855.7	rew	08/13/84	0855.7	140436
NASA.I.FEATURE_ANALYSIS.runoff	08/08/84	0748.0	rew	08/08/84	0748.0	3087
NASA.I.user_categories.runoff	08/08/84	0755.8	rew	08/08/84	0755.8	65979
NASA.I.data_models.runoff	08/08/84	0812.1	rew	08/08/84	0810.2	111087
NASA.I.logical.runoff	08/08/84	0939.6	rew	08/08/84	0939.6	35613
NASA.I.physical.runoff	08/09/84	0810.8	rew	08/09/84	0810.9	87399
NASA.I.db_definition.runoff	08/13/84	0912.0	rew	08/13/84	0912.0	35505
NASA.I.db_interrogation.runoff	08/13/84	0944.3	rew	08/13/84	0941.0	265113
NASA.I.db_report_gen.runoff	08/13/84	1058.8	rew	08/13/84	1057.5	143703
NASA.I.db_update.runoff	08/10/84	0920.7	rew	08/10/84	0920.7	49986
NASA.I.db_redefinition.runoff	08/08/84	1716.4	rew	08/08/84	1716.5	40293
NASA.I.administration.runoff	08/08/84	1718.1	rew	08/08/84	1718.1	77490
NASA.I.db_security.runoff	08/09/84	0704.1	rew	08/09/84	0704.1	34470
NASA.I.pme_overview.runoff	08/08/84	1632.5	rew	08/08/84	1632.5	91791
NASA.I.BIB_DB_DESIGN.runoff	08/08/84	1634.6	rew	08/08/84	1634.7	4914
NASA.I.bib_db_design.runoff	08/13/84	1121.0	rew	08/13/84	1121.1	69858
NASA.I.BIB_FILE_STRUCTURE.runoff	08/09/84	0707.3	rew	08/07/84	0949.1	5526
NASA.I.linear.runoff	08/09/84	0710.9	rew	08/09/84	0710.9	28602
NASA.I.list_structured.runoff	08/09/84	0722.2	rew	08/09/84	0722.2	29322
NASA.I.clustered.runoff	08/09/84	0728.6	rew	08/09/84	0728.6	31392
NASA.I.VOCABULARY_CONTROL.runoff	08/09/84	0729.4	rew	08/07/84	0949.1	3600
NASA.I.controlled.runoff	08/09/84	0740.0	rew	08/09/84	0740.1	41364
NASA.I.free_text.runoff	08/09/84	0743.4	rew	08/09/84	0743.4	14499
NASA.I.thesaurus.runoff	08/09/84	0752.2	rew	08/09/84	0752.2	48339
NASA.I.BIB_SEARCHING.runoff	08/09/84	0755.4	rew	08/09/84	0755.4	2259
NASA.I.language_types.runoff	08/13/84	1650.4	rew	08/13/84	1453.1	212886
NASA.I.search_formulation.runoff	08/11/84	1705.0	rew	08/11/84	1705.0	185526
NASA.I.output_generation.runoff	08/11/84	1118.5	rew	08/11/84	1118.6	116370
NASA.I.instruction.runoff	08/10/84	0645.7	rew	08/10/84	0645.8	48015
NASA.I.APPLICATION_AREAS.runoff	08/10/84	0657.7	rew	08/10/84	0657.7	4554
NASA.I.sdi.runoff	08/13/84	1549.8	rew	08/13/84	1549.9	18891
NASA.I.personal_files.runoff	08/13/84	1554.7	rew	08/13/84	1554.7	32706
NASA.I.document_delivery.runoff	08/13/84	1558.7	rew	08/13/84	1558.8	12699
NASA.I.IS&R_PME.runoff	08/13/84	1601.9	rew	08/13/84	1601.9	2889
NASA.I.pme_life_cycle.runoff	08/13/84	1650.0	rew	08/13/84	1650.1	139671
NASA.I.obtrusive.runoff	08/10/84	1703.3	rew	08/10/84	1703.3	85851
NASA.I.unobtrusive.runoff	08/13/84	1702.0	rew	08/13/84	1702.0	129555
NASA.I.FUTURES.runoff	08/13/84	1706.1	rew	08/13/84	1706.1	3042
NASA.I.system_example.runoff	07/31/84	0856.8	rew	07/31/84	0849.5	360
NASA.I.discipl_example.runoff	07/31/84	0857.0	rew	07/31/84	0849.5	396
NASA.I.mix_inf.runoff	08/13/84	1610.0	rew	08/13/84	1610.0	17415
NASA.V.system_example.runoff	08/08/84	0750.2	rew	08/07/84	0949.3	360
NASA.V.discipl_example.runoff	08/08/84	0750.4	rew	08/07/84	0949.3	396
NASA.I.futures.runoff	08/13/84	1722.3	rew	08/13/84	1722.3	133227
NASA.I.PC_env.runoff	08/13/84	1613.5	rew	08/13/84	1613.5	14940

>add>DEMS>NASA/RECON>NASA.proposals
quota = 0; used = 43

quota	used	directory name
-------	------	----------------

0	10	resumes
0	2	specifications
0	12	Total

Segments = 1, Lengths = 31.

r w 31 NASA.system_proposal.runout

>udd>DEMS>NASA/RECON>NASA.proposals>resumes
quota = 0; used = 10

Segments = 7, Lengths = 10.

rew 1 GallagherMC.resume.runoff
rew 2 KaviS.resume.runoff
rew 2 TriantafyllopoulosS.resum.runoff
rew 2 HallPP.resume.runoff
r w 0 MoreauDR.resume.runoff
rew 2 ChumFY.resume.runoff
r w 1 GranierMR.resume.runoff

>udd>DEMS>NASA/RECON>NASA.proposals>specifications
quota = 0; used = 2

Segments = 1, Lengths = 2.

r w 2 NASA.proposals.specs.archive
p.archive

>udd>DEMS>NASA/RECON>NASA.proposals>specifications>NASA.proposals.specs.archive

name	updated	mode	modified	length
NASA.systems.review_specs.runoff	06/29/84 2057.4	r w	05/15/84 1628.5	28458
NASA.systems.06/29/84.runoff	06/29/84 2059.0	rew	06/29/84 2058.6	42741

>udd>DEMS>NASA/RECON>NASA.PC.r&d
quota = 0; used = 8

quota	used	directory name
0	2	specifications
0	6	RECON_simulator
0	8	Total

Segs=0;Msfs=0;Dirs=2;Links=0.

>udd>DEMS>NASA/RECON>NASA.PC.r&d>specifications
quota = 0; used = 2

Segments = 1, Lengths = 2.

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rew    2  NASA.PC.specifications.archive
        s.archive
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>udd>DEMS>NASA/RECON>NASA.PC.r&d>specifications>NASA.PC.specifications.archive
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name	updated	mode	modified	length
NASA.PC.specs.06/06/84.runoff	06/06/84 1710.1	r w	06/06/84 1705.2	30771
NASA.PC.C_sys_dev_stds.runoff	07/12/84 1244.5	r w	07/12/84 1240.6	28053

```
>udd>DEMS>NASA/RECON>NASA.PC.r&d>RECON_simulator
quota = 0; used = 6
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Segments = 1, Lengths = 6.

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rew    6  NASA.PC_simulator.specs.runoff
        s.runoff
        s
```

ATTACHMENT 6.7

USL DBMS NASA/RECON BIBLIOGRAPHIC
SUPPORT DATA BASE STATUS

USL DBMS.NASA/RECON MADAM DATA BASE STATUS

Logical data base name : DBMS.NASA/RECON
Physical data base path name : >udd>DBMS>NASA/RECON>r&d
Date Inversion : yes
Text Inversion : yes
Standard Stopword List : yes
User Stopword List : no
User Keyword List : no
Comments File : yes
Bulletin File : yes
Thesaurus File : no
Macro File : yes
Textual Description : yes
Public/Private File : private
Data Base Administrator : ChumFY.DBMS
Number of Records : 55
Creation Date : 01/05/84
Latest Update : 04/22/84

This MADAM database "DBMS.NASA/RECON" contains a full citation for the reading material relevant to the NASA/RECON contract work.

DBMS.NASA/RECON OUTPUT (08/01/84, 1716.44)

REFERENCE CODE: 1

JOURNAL:

DATE: 09/01/78

TITLE:

THE NASA SCIENTIFIC AND TECHNICAL INFORMATION SYSTEM ITS SCOPE AND COVERAGE

AUTHOR(s):

CHANDLER, GEORGE P. JR.

AFFILIATION:

NASA SCIENTIFIC AND TECHNICAL INFORMATION BRANCH

ABSTRACT:

THE NASA SCIENTIFIC AND TECHNICAL INFORMATION SYSTEM HAS BEEN DEVELOPED TO PROVIDE NASA AND THE AEROSPACE COMMUNITY WITH THE INFORMATION TOOLS TO ACCOMPLISH THEIR MISSIONS IN THE MOST EFFECTIVE AND EFFICIENT MANNER. NASA'S MISSION ALSO INCLUDES THE RESPONSIBILITY OF PROVIDING MAXIMUM USE OF ACQUIRED KNOWLEDGE FOR THE BENEFIT OF ALL MANKIND. THE SYSTEM IS A HIGHLY AUTOMATED ACTIVITY THAT NOT ONLY MEETS THE INFORMATION REQUIREMENTS OF NASA AND OTHERS BUT PROVIDES ACCESS TO THE MASSIVE FLOW OF THIS AND RELATED INFORMATION TO OTHER GOVERNMENT, INDUSTRIAL AND ACADEMIC GROUPS. THIS PUBLICATION LISTS THE SUBJECT CRITERIA APPLIED TO VARIOUS DOCUMENTS TO GOVERN THE DECISIONS FOR ACCEPTING ADDITIONS TO THE NASA INFORMATION BANK. IN ADDITION IT ESTABLISHES SUBJECT GUIDANCE FOR THOSE DESIRING TO ADD DOCUMENTS TO THE COLLECTION OR TO SEARCH THE COLLECTION FOR DOCUMENTS OF INTEREST TO MEET THEIR NEEDS.

KEYWORDS:

SUBJECT CRITERIA * SUBJECT GUIDANCE * SYSTEM PURPOSE * INFORMATION TOOLS *
NASA INFORMATION SYSTEM

CATEGORIES:

1.52 * 3.1 * 3.2 * 3.7

REFERENCE CODE: 2

JOURNAL:

INTERNATIONAL AEROSPACE ABSTRACTS

VOLUME: 22

ISSUE: 20
DATE: 10/15/82

TITLE:
INTERNATIONAL AEROSPACE ABSTRACTS

AUTHOR(s):
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:
TECHNICAL INFORMATION SERVICE * AMERICAN INSTITUTE OF AERONAUTICS AND
ASTRONAUTICS.

ABSTRACT:
INTERNATIONAL AEROSPACE ABSTRACTS IS AN ABSTRACTING AND INDEXING SERVICE
COVERING THE WORLD'S PUBLISHED LITERATURE IN THE FIELD OF AERONAUTICS,
SPACE SCIENCE AND TECHNOLOGY. IAA CONTAINS THE ABSTRACTS SECTION WITH 75
SUBJECT CATEGORIES AND THE INDEX SECTION UNDER 5 INDICES. LITERATURE
COVERED INCLUDES PERIODICALS, MEETING PAPERS AND CONFERENCE PROCEEDINGS
AND TRANSLATIONS OF JOURNALS AND ARTICLES. A CUMMULATIVE INDEX APPEARS
EACH YEAR.

KEYWORDS:
INFORMATION CLASSIFICATION * AEROSPACE ABSTRACTS * INDEXING * ABSTRACTS

CATEGORIES:
3.1 * 3.2 * 3.56

REFERENCE CODE: 3

JOURNAL:
STAR: AN ABSTRACT JOURNAL
VOLUME: 20
ISSUE: 21
DATE: 11/08/82

TITLE:
SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

AUTHOR(s):
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:
SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS (STAR) IS A MAJOR COMPONENT OF
A COMPREHENSIVE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION INFORMATION
SYSTEM COVERING AERONAUTICS, SPACE AND SUPPORTING DISCIPLINES. SUBJECT
SCOPE OF STAR INCLUDES ALL ASPECTS OF AERONAUTICS AND SPACE RESEARCH AND
DEVELOPMENT, SUPPORTING BASIC AND APPLIED RESEARCH AND APPLICATIONS.

KEYWORDS:
SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS * STAR * ABSTRACTS * SCIENTIFIC
REPORTS

CATEGORIES:
3.1 * 3.2 * 3.5

REFERENCE CODE: 4

JOURNAL:

DATE: 09/09/83

TITLE:
NASA/RECON USERS

AUTHOR(s):
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:
THIS ENTRY LISTS ALL NASA/RECON SYSTEM USERS AS OF 09/09/83 SORTED BY
STATE AND CITY.

KEYWORDS:
NASA/RECON USERS * SYSTEM USERS

REFERENCE CODE: 5

JOURNAL:

TITLE:
THE NASA INFORMATION SYSTEM AND HOW TO USE IT

AUTHOR(s):
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:
THE NASA INFORMATION SYSTEM OFFERS ACCESS TO A COMPUTERIZED DATA BASE
CONTAINING CITATIONS OF MORE THAN TWO MILLION DOCUMENTS RELATED TO
AERONAUTICS AND SPACE. IT ALSO PROVIDES AUTOMATIC REPORT DISTRIBUTION,
PRINTING OF RESEARCH AND DEVELOPMENT RESULTS, CONFERENCE PROCEEDINGS AND

OTHER SPECIAL PUBLICATIONS. OTHER SERVICES INCLUDE PREPARATION OF TECHNICAL TRANSLATIONS AND ANNOUNCEMENTS. THROUGH NASA/RECON, AN ONLINE INTERACTIVE SYSTEM, THE PROGRAM ALSO PROVIDES DIRECT RAPID RETRIEVAL OF INFORMATION FROM THE NASA DATABASE. THE PROFILES OF THIS GUIDE DESCRIBE THE SERVICES AND PRODUCTS AVAILABLE FROM NASA. EACH PROFILE IS A COMPLETE DESCRIPTION OF THE PRODUCT OR SERVICE AVAILABLE.

KEYWORDS:

TECHNICAL REPORTS * SCIENTIFIC REPORTS * SYSTEM PROFILES * NASA/RECON

CATEGORIES:

3.1 * 3.2 * 3.5 * 3.7

REFERENCE CODE: 6

JOURNAL:

TITLE:

NASA STI-RECON BULLETIN AND TECH INFO NEWS

AUTHOR(s):

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:

NASA STI-RECON BULLETIN AND TECH INFO NEWS IS DISTIRBUTED TO ESTABILISHED USERS TO KEEP THEM INFORMED ABOUT NASA'S SCIENTIFIC AND TECHNICAL INFORMATION PRODUCTS AND SERVICES. THIS BULLETIN IS PUBLISHED MONTHLY

KEYWORDS:

USER SERVICES * BULLETIN * SYSTEM UPDATES * SYSTEM NEWS

CATEGORIES:

3.5 * 3.7

REFERENCE CODE: 7

JOURNAL:

TITLE:

NASA RECON USER'S BULLETIN

AUTHOR(s):

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:

NASA RECON USER'S BULLETIN IS DISTRIBUTED TO ESTABLISHED RECON USERS TO KEEP THEM INFORMED ABOUT RECON CHANGES, ENHANCEMENTS, POLICY, CHARGING AND OTHER RECON ASPECTS. THIS IS A MONTHLY PUBLICATION.

KEYWORDS:

USER SERVICES * SYSTEM NEWS * SYSTEM UPDATES

CATEGORIES:

3.5 * 3.7

REFERENCE CODE: 8

JOURNAL:

DATE: 01/05/80

TITLE:

NASA/RECON SYSTEM USER'S MANUAL

AUTHOR(s):

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:

NATIONAL AERONAUTICS AND SPACE AND SPACE ADMINISTRATION

ABSTRACT:

NASA/RECON IS A COMPUTERIZED SYSTEM THAT ENABLES USERS TO CONDUCT THEIR OWN SEARCHES THROUGH A HUGE LIBRARY CATALOG OF TECHNICAL PUBLICATIONS. THE SYSTEM CONSISTS OF A COMMUNICATIONS NETWORK, AN INFORMATION STORAGE AND RETRIEVAL FACILITY, AND A PROGRAMMED COMPUTER SYSTEM WITH A CENTRAL COMPUTER. EACH RECON USER CAN ASK THE CENTRAL COMPUTER TO LIST THE CITATIONS OF DOCUMENTS IN THE SYSTEM LIBRARY CATALOG THAT ARE OF INTEREST TO HIM. THE SYSTEM RESPONDS BY DISPLAYING THE ANSWERS ON THE CATHODE RAY TUBE OR BY TYPING IT ON A TELEPRINTER. THE INFORMATION RETRIEVED IS IN THE FORM OF CITATIONS THAT DESCRIBE TECHNICAL PUBLICATIONS. A USER CAN SEARCH FOR ARTICLES OR BOOKS BY DATE, AUTHOR, PUBLISHER, OR OTHER CRITERIA. A THESAURUS CAN RETRIEVE CITATIONS RELATED TO THE SUBJECT. THE RECON USER MANUAL IS DESIGNED TO SERVE AS A NONTECHNICAL DESCRIPTION AND A PRIMER TO INEXPERIENCED USERS, AS WELL AS A REFERENCE MANUAL FOR THE EXPERIENCED USER. IT ALSO INCLUDES THE RECON COMMAND LANGUAGE, SEARCH STRATEGY, A DESCRIPTION OF USER TERMINALS AND TELETYPES, AND AN INDEX.

KEYWORDS:

NASA/RECON * USER MANUAL * COMMAND LANGUAGE * INFORMATION STORAGE AND RETRIEVAL * TERMINALS * USER GUIDE

CATEGORIES:

1.1 * 2.4 * 3.5 * 3.7 * 3.8 * 4.33

REFERENCE CODE: 9

JOURNAL:

DATE: 09/01/83

TITLE:

TIS : AN INTELLIGENT GATEWAY COMPUTER FOR INFORMATION AND MODELLING NETWORKS OVERVIEW

AUTHOR(s):

HAMPEL, VIKTOR K.

AFFILIATION:

LAURENCE LIVERMORE NATIONAL LABORATORY

ABSTRACT:

THE TECHNOLOGY INFORMATION SYSTEM (TIS) IS BEING USED TO DEVELOP SOFTWARE FOR INTELLIGENT GATEWAY COMPUTERS (IGC) SUITABLE FOR THE PROTOTYPING OF ADVANCED, INTEGRATED INFORMATION NETWORKS. DEDICATED TO INFORMATION MANAGEMENT, TIS LEADS THE USER TO AVAILABLE INFORMATION RESOURCES, ON TIS OR ELSEWHERE, BY MEANS OF A MASTER DIRECTORY AND AUTOMATED ACCESS PROCEDURES. OTHER GEOGRAPHICALLY DISTIRBUTED INFORMATION SYSTEMS ACCESSED THROUGH TIS INCLUDE FEDERAL AND COMMERCIAL SYSTEMS LIKE DOE/RECON, NASA/RECON, DOD/DROLS, DOT/TIC, CIS, AND DIALOG IN THE UNITED STATES, THE CHEMICAL INFORMATION SYSTEMS DARC IN FRANCE AND DECHEMA IN WEST GERMANY.

KEYWORDS:

TIS * TECHNICAL INFORMATION SYSTEM * NETWORK SYSTEMS * IGC * INTELLIGENT GATEWAY COMPUTERS * NETWORK PROTOTYPING

CATEGORIES:

3.1 * 3.2 * 3.5 * 3.7 * 3.81

REFERENCE CODE: 10

JOURNAL:

DATE: 09/26/83

TITLE:

LOGIN INSTRUCTIONS FOR TELENET ACCESS

AUTHOR(s):

GENERAL TELECOMMUNICATIONS EQUIPMENT

AFFILIATION:

GTE TELENET COMMUNICATIONS CORPORATION

ABSTRACT:

THIS ENTRY CONTAINS LOGIN INSTRUCTIONS FOR TELENET. ADDITIONAL INFORMATION ABOUT TELENET AND TELEMAL, TELENET'S ELECTRONIC MAIL FACILITY ARE PROVIDED.

KEYWORDS:

TELENET * LOGIN * LOGIN INSTRUCTIONS * ELECTRONIC MAIL

CATEGORIES:

2.43 * 3.57 * 3.8

REFERENCE CODE: 11

JOURNAL:

VOLUME: 1

DATE: 01/01/82

TITLE:

NASA THESAURUS VOLUME 1 - HIERARCHICAL LISTINGS

AUTHOR(s):

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:

THE NASA THESAURUS CONTAINS THE SUBJECT TERMS BY WHICH THE DOCUMENTS IN THE NASA INFORMATION SYSTEM ARE INDEXED AND RETRIEVED. THE NASA THESAURUS COMPRISES TWO VOLUMES: VOLUME 1 FOR THE HIERARCHICAL LISTINGS AND VOLUME 2: THE ACCESS VOCABULARY. THE LISTING CONTAINS POSTABLE AND NON-POSTABLE ITEMS. INCLUDED ARE TERMS APPEARING IN THE NASA THESAURUS PRELIMINARY EDITION (DECEMBER 1967), NASA THESAURUS ALPHABETICAL UPDATE (SEPTEMBER 1971), THE NASA THESAURUS (JANUARY 1976) AND OTHER TERMS APPEARING THROUGH NOVEMBER, 1977.

KEYWORDS:

NASA THESAURUS * INFORMATION STORAGE AND RETRIEVAL * HIERARCHICAL LISTINGS

CATEGORIES:

3.5 * 3.7 * 4.33

REFERENCE CODE: 12

JOURNAL:

VOLUME: 2
DATE: 01/01/82

TITLE:
NASA THESAURUS VOLUME 2 - ACCESS VOCABULARY

AUTHOR(s):
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:
THE ACCESS VOCABULARY IS MADE AVAILABLE AS A READY REFERENCE TOOL TO PROVIDE BETTER ACCESS TO THE NASA THESAURUS VOLUME 1, HIERARCHICAL LISTING. IT UTILIZES PSEUDO-TERMS (PERMUTED TERMS), PSEUDO-MULTITERMS, OTHER WORD ENTRIES, NONPOSTABLE TERMS (CROSS REFERENCE) AND POSTABLE TERMS.

KEYWORDS:
NASA THESAURUS * INFORMATION STORAGE AND RETRIEVAL * ACCESS VOCABULARY

CATEGORIES:
3.5 * 3.7 * 4.33

REFERENCE CODE: 13

JOURNAL:

DATE: 01/07/82

TITLE:
COMBINED FILE POSTING STATISTICS BASED ON NASA THESAURUS

AUTHOR(s):
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:
THIS ALPHABETICAL LISTING OF POSTABLE SUBJECT TERMS CONTAINED IN THE NASA THESAURUS IS USED TO DISPLAY THE NUMBER OF POSTINGS (DOCUMENTS) INDEXED BY EACH SUBJECT TERM FROM 1968 TO DATE. THE POSTING TOTALS PER TERM ARE SEPARATED BY ANNOUNCEMENT OR OTHER MEDIA INTO STAR, IAA, CSTAR, AND OTHER COLUMNAR ENTRIES COVERING THE NASA DOCUMENT COLLECTION.

KEYWORDS:
FILE STATISTICS * INFORMATION STORAGE AND RETRIEVAL * PERFORMANCE MEASUREMENT AND EVALUATION * NASA THESAURUS

CATEGORIES:
3.51 * 3.7 * 4.6

REFERENCE CODE: 14

JOURNAL:

DATE: 09/01/82

TITLE:
CORPORATE SOURCE AUTHORITY LIST

AUTHOR(s):
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:
THE LISTED CORPORATE SOURCES HAVE BEEN APPROVED FOR USE IN THE CUMMULATIVE INDEXES TO THE NASA ABSTRACT JOURNALS. THE CODED TERMS ARE USED IN COMPLETING THE DOCUMENT PROCESSING FORMS OR APPROVED SUBSTITUTE FORMS. THESE ABRIDGED ENTRIES HAVE BEEN DEVELOPED FROM THE FULL CORPORATE AUTHOR THAT APPEAR IN THE CITATIONS USED IN THE ABSTRACT SECTION.

KEYWORDS:
ABSTRACT JOURNALS * INFORMATION SOURCES * AUTHORITY LIST

CATEGORIES:
3.5 * 3.7

REFERENCE CODE: 15

JOURNAL:

DATE: 09/01/83

TITLE:
CORPORATE SOURCE AUTHORITY LIST

AUTHOR(s):
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:
THE LISTED CORPORATE SOURCES HAVE BEEN APPROVED FOR USE IN THE CUMMULATIVE INDEXES TO THE NASA ABSTRACT JOURNALS. THE CODED TERMS ARE USED IN

COMPLETING THE DOCUMENT PROCESSING FORMS OR APPROVED SUBSTITUTE FORMS.
THESE ABRIDGED ENTRIES HAVE BEEN DEVELOPED FROM THE FULL CORPORATE AUTHOR
THAT APPEAR IN THE CITATIONS USED IN THE ABSTRACT SECTION.

KEYWORDS:

ABSTRACT JOURNALS * INFORMATION SOURCES * AUTHORITY LIST

CATEGORIES:

3.5 * 3.7

REFERENCE CODE: 16

JOURNAL:

TITLE:

THE CHEMICAL SUBSTANCES INFORMATION NETWORK

AUTHOR(s):

CHEMICAL SUBSTANCES INFORMATION NETWORK

AFFILIATION:

CHEMICAL SUBSTANCES INFORMATION NETWORK

ABSTRACT:

THE CHEMICAL SUBSTANCES INFORMATION NETWORK (CSIN) IS A NETWORK OF
COORDINATED ONLINE INFORMATION SYSTEMS CONCERNING CHEMICAL SUBSTANCES. ITS
PURPOSE IS TO SATISFY THE INFORMATION REQUIREMENTS OF TOXIC SUBSTANCES
LEGISLATION AND A BROAD SPECTRUM OF RELATED ACTIVITIES. THE CHEMICAL
SUBSTANCES INFORMATION NETWORK PROVIDES INFORMATION ON NOMENCLATURE AND
COMPOSITION, PROPERTIES, PRODUCTION AND COMMERCE, PRODUCTS AND USES,
EXPOSURE, EFFECTS, STUDIES AND RESEARCH AND REGULATIONS AND CONTROLS OF
CHEMICAL SUBSTANCES.

KEYWORDS:

CSIN * CHEMICAL SUBSTANCES INFORMATION NETWORK * INFORMATION NETWORKS *
CHEMICAL INFORMATION * CHEMISTRY * CHEMICAL SUBSTANCES

CATEGORIES:

3.12 * 3.13 * 3.22 * 3.33 * 3.54 * 3.7

REFERENCE CODE: 17

JOURNAL:

VOLUME: 1

TITLE:

AN ANALYSIS OF REQUIREMENTS FOR THE CHEMICAL SUBSTANCES INFORMATION NETWORK

AUTHOR(s):

WILSON GERALD A. * BARNET JANE E. * MARKS BENNET D. * KULP CAROL S

AFFILIATION:

COMPUTER CORPORATION OF AMERICA

ABSTRACT:

A MAJOR CONCLUSION FROM THIS ANALYSIS IS THAT THERE IS NO APPROPRIATE CONNECTION BETWEEN USER'S INFORMATION NEEDS AND EXISTING INFORMATION TOOLS. INDIVIDUAL DATABASES DO NOT IN GENERAL PROVIDE ALL THE REQUIRED DATA; THUS USERS FIRST HAVE TO FIRST LOCATE AND THEN SEARCH THROUGH POTENTIALLY MANY DATABASES TO INSURE A PROPER TREATMENT OF A SUBJECT. OF ALL THE CHEMICAL INFORMATION NEEDS, THE MOST PRESSING IS THE NEED TO MORE EFFECTIVELY INTEGRATE AND ACCESS THE INFORMATION THAT IS ALREADY AVAILABLE. EXISTING INFORMATION SYSTEMS DO NOT LEND THEMSELVES TO INFORMATION SEARCHES OF THE NESSECARY BROAD NATURE. THE SURVEYED COMMUNIT BELIEVES THERE IS A GREAT NEED FOR AN INFORMATION SYSTEM THAT WOULD PERMIT THEM TO PERFORM SEARCHES AND DATA INTEGRATION WITHOUT REQUIRING DIRECT US OF MANY DIFFERENT SYSTEMS. SO EFFECTIVE COORDINATION OF EXISTING INFORMATION SYSTEMS MUST BE OBTAINED.

KEYWORDS:

CSIN * CHEMICAL SUBSTANCES INFORMATION SYSTEM * INFORMATION NETWORKS * CHEMICAL INFORMATION * CHEMISTRY * CHEMICAL SUBSTANCES * REQUIREMENTS ANALYSIS OF INFORMATION SYSTEMS

CATEGORIES:

3.12 * 3.13 * 3.22 * 3.33 * 3.54 * 3.7

REFERENCE CODE: 18

JOURNAL:

TITLE:

CURRENT CSIN CAPABILITIES

AUTHOR(s):

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:

CSIN - THE CHEMICAL SUBSTANCES INFORMATION NETWORK - IS A POWERFUL NETWORKING TOOL DESIGNED TO: SPEED ACCESS TO A WIDE SPECTRUM OF CHEMICAL AND NON-CHEMICAL DATA BASES; COORDINATE SEARCHES IN THESE DATABASES; REDUCE ERRORS; COLLECT AND EDIT SEARCH DATA IN THE REQUESTED OUTPUT FORMAT; REDUCE SEARCH TIME FOR REPETITIOUS SEARCHES; PERMIT SEARCHERS WITH A WIDE VARIETY OF BACKGROUND TO PERFORM SEARCHES. CSIN PROVIDES THREE

DIFFERENT SEARCH MODES. IN ADDITION, CSIN PROVIDES A VARIETY OF UTILITIES TO SUPPORT SEARCHES AND PERMIT USER CUSTOMIZATION. CSIN ALSO ALLOWS USERS TO SHARE INFORMATION AND SEARCH STRATEGIES WITHIN A DEFINED SEARCH GROUP.

KEYWORDS:

CSIN * CHEMICAL SUBSTANCES INFORMATION NETWORK * CHEMICAL INFORMATION SYSTEMS * INFORMATION STORAGE AND RETRIEVAL * INFORMATION NETWORKS * DATA BASE MANAGEMENT SYSTEMS *

CATEGORIES:

3.13 * 3.12 * 3.22 * 3.7 * 4.33

REFERENCE CODE: 19

JOURNAL:

TITLE:

PLAN FOR AN EVALUATION OF THE CSIN PROTOTYPE

AUTHOR(s):

BOLK BERANAK AND NEWMAN, INC.

AFFILIATION:

BOLK BERANAK AND NEWMAN, INC.

ABSTRACT:

THE DEVELOPMENT OF A COMPLEX PROJECT LIKE CSIN REQUIRES PERIODIC EVALUATION. THE MODULAR DESIGN AND IMPLEMENTATION PLAN OF CSIN OFFERS CONVENIENT PLACES WITHIN THE PLAN FOR EVALUATION AND RESSESSEMENT. THESE AREAS INCLUDE ASSESSEMENT OF SYSTEM PERFORMANCE, ASSESSEMENTS OF SYSTEM USABILITY, DETERMINATION OF SYSTEM IMPACT, AND FUTURE PLANNING. THE EVALUATION AUDIENCE INCLUDES SPONSORING ORGANIZATIONS, POTENTIAL SPECIALIST/NONSPECIALIST USERS, PARTICIPATING AND POTENTIAL DATABASE SYSTEMS, AND SYSTEM R&D STAFF. INFORMATION NEEDED DURING THE CYCLE WILL COME FROM POTENTIAL AND ACTUAL USERS, PROJECT SPONSORS, SYSTEM DEVELOPERS, THE USERS SERVICE OFFICE AND OTHERS. THE METHODOLOGIES AVAILABLE FOR INFORMATION COLLECTION CAN INCLUDE ROUTINE SYSTEM DATA COLLECTION, ACCOUNTING FILES, USER LOG/TRAIL FILES, UP/DOWNTIME LOGS, USER SERVICE RECORDS, SYSTEM EXPERIMENTS, USER PRODUCTIVITY STUDIES, AND SYSTEM PERFORMANCE STUDIES. USER SURVEYS AND QUESTIONNAIRES (REGULAR AND ON-LINE) CAN ALSO BE USED. INCLUDED IS ALSO A REPORT OF THE SYSTEM PERFORMANCE EVALUATION METHODOLOGY TO BE FOLLOWED. ANALYSIS OF DATA, AND A TIMETABLE OF THE PROCEEDINGS ARE NESSECARY FOR THE CORRECT ANALYSIS AND ARE ALSO INCLUDED.

KEYWORDS:

CSIN * CHEMICAL SUBSTANCES INFORMATION NETWORK * CHEMICAL INFORMATION SYSTEMS * PERFORMANCE MEASUREMENT AND EVALUATION * INFORMATION NETWORKS DATA BASE MANAGEMENT SYSTEMS

CATEGORIES:

3.13 * 3.12 * 3.22 * 3.72 * 4.33

REFERENCE CODE: 20

JOURNAL:

TITLE:

PROCEEDINGS OF THE WORKSHOP ON DATA QUALITY INDICATORS

AUTHOR(s):

CHEMICAL MANUFACTURERS ASSOCIATION

AFFILIATION:

CHEMICAL MANUFACTURERS ASSOCIATION

ABSTRACT:

DATA QUALITY INDICATORS ARE FEASIBLE AND SUCH INDICATORS ARE NEEDED IN COMPUTERIZED DATA BASES. DATA QUALITY INDICATORS SHOULD CONTAIN INFORMATION ABOUT FOUR DISTINCT ELEMENTS: THE METHOD TO OBTAIN THE DATA, THE EXTENT TO WHICH THE DATA HAVE BEEN EVALUATED, THE DATA SOURCE AND AN INDICATION OF DATA ACCURACY. THESE INDICATORS SHOULD PROVIDE THE USER WITH ENOUGH INFORMATION TO DETERMINE THE UTILITY AND SUITABILITY OF THE DATA FOR SPECIFIC USES. AT A MINIMUM SUCH INDICATORS COULD IDENTIFY WHERE THE USER COULD OBTAIN OR DERIVE THIS INFORMATION.

KEYWORDS:

CHEMICAL INFORMATION SYSTEMS * INFORMATION STORAGE AND RETRIEVAL * INFORMATION NETWORKS * DATA BASE MANAGEMENT SYSTEMS

CATEGORIES:

3.13 * 3.12 * 3.22 * 3.72 * 4.33

REFERENCE CODE: 21

JOURNAL:

DATE: 01/16/84

TITLE:

CMPS669 NASA/RECON HANDOUTS

AUTHOR(s):

DOMINICK, WAYNE D.

AFFILIATION:

UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:

THIS SERIES OF HANDOUTS INCLUDES THE FOLLOWING: CMPS669 SYLLABUS, THE NASA/RECON COURSE DEVELOPEMENT, ADMINISTRATION AND EVALUATION PROPOSAL, THE CMPS669 NASA/RECON COURSE CONTENTS OUTLINE, AND VARIOUS NASA/RECON MEETING AGENDAS AND NOTES.

REFERENCE CODE: 22

JOURNAL:

DATE: 01/16/84

TITLE:

CMPS669 NASA/RECON POTENTIAL FOILS

AUTHOR(s):

DOMINICK, WAYNE D.

AFFILIATION:

UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:

THIS SERIES OF FOILS FOR POTENTIAL USE WITHIN THE NASA/RECON CONTRACT WORK INCLUDES THE FOLLOWING: INTRODUCTION, DBMS, IS&R FEATURE ANALYSIS SUMMARY, COMPARISON, MIS/DSS META-BASE, GUIDE/SHARE, CODASYL, RELATIONAL, DB DESIGN, LOGICAL, PHYSICAL, IS&R FILE ORGANIZATIONS, CLUSTERING, VOCABULARY, INDEXING, LANGUAGES, HUMAN FACTORS, IS&R SYSTEMS, APPLICATIONS, INSTRUCTION, IS&R PME, TRADITIONAL, AUTOMATED, LIFE CYCLE, INTERFACES, DISTIRBUTED ENVIRONMENTS, AND FUTURES.

REFERENCE CODE: 23

JOURNAL:

DATE: 12/31/80

TITLE:

INDEX TO NASA/RECON USER'S BULLETIN

AUTHOR(s):

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:

NASA SCIENTIFIC AND TECHNICAL INFORMATION BRANCH * NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:

THIS PUBLICATION CONTAINS AN INDEX TO THE NASA/RECON USER'S BULLETIN. THE DATES INCLUDED IN THE INDEX ARE 01/01/79 THROUGH 12/31/80. ALSO,

ADDITIONAL COPIES OF THE USER'S BULLETIN ARE INCLUDED. INDEXING IS DONE THROUGH TITLE OR SUBJECT.

KEYWORDS:

SUBJECTS * SUBJECT INDEX * NASA/RECON USER'S BULLETIN * NASA INFORMATION SYSTEM * NASA/RECON

REFERENCE CODE: 24

JOURNAL:

DATE: 01/14/84

TITLE:

NASA - STI FACILITY ANNOUNCEMENTS

AUTHOR(s):

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:

NASA SCIENTIFIC AND TECHNICAL INFORMATION BRANCH * NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:

THIS ENTRY CONTAINS VARIOUS ANNOUNCEMENTS SENT BY THE NASA SCIENTIFIC AND TECHNICAL INFORMATION FACILITY. THESE ANNOUNCEMENTS ARE IN ADDITION OF THE NEWSLETTERS AND CONTAIN INFORMATION ABOUT THE NASA STI FACILITY.

KEYWORDS:

NASA INFORMATION SYSTEM * NASA/RECON * SCIENTIFIC AND TECHNICAL FACILITY

REFERENCE CODE: 25

JOURNAL:

DATE: 01/14/84

TITLE:

NASA - PERSONAL COMPUTERS ANALYSIS AND EVALUATION

AUTHOR(s):

DOMINICK, WAYNE D. * CHUM, FRANK Y. * TRIANTAFYLLOPOULOS, SPIROS

AFFILIATION:

UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:

THIS ENTRY CONTAINS VARIOUS ANALYSIS AND EVALUATION ARTICLES, MAGAZINES AND OTHER INFORMATION SOURCES THAT DISCUSS PERSONAL COMPUTERS. THIS

INFORMATION IS NEEDED IN ORDER TO PERFORM COST/EFFECTIVENESS ANALYSIS OVER EQUIPMENT TO BE USED IN THE NASA/RECON AND OTHER SUBSEQUENT PROJECTS.

KEYWORDS:

NASA INFORMATION SYSTEM * EQUIPMENT SELECTION * EQUIPMENT EVALUATION

REFERENCE CODE: 26

JOURNAL:

INFORMATION TODAY

DATE: 01/01/84

TITLE:

INFORMATION TODAY

AUTHOR(s):

AFFILIATION:

LEARNED INFORMATION, INC.

ABSTRACT:

THIS MONTHLY MAGAZINE CONTAINS INFORMATION ABOUT THE DESIGN, USAGE AND ADMINISTRATION OF LARGE ON-LINE INFORMATION SYSTEMS. ITS ARTICLES COVER FEATURE ANALYSES OF INFORMATION SYSTEMS, EQUIPMENT AND SERVICE REVIEWS, USERS VIEWS AND OTHER INFORMATION RELEVANT TO THE NASA/RECON CONTRACT.

KEYWORDS:

INFORMATION SYSTEMS * ON-LINE SYSTEMS * INFORMATION STORAGE AND RETRIEVAL SYSTEMS * ELECTRONIC INFORMATION SYSTEMS

REFERENCE CODE: 27

JOURNAL:

DATE: 02/15/84

TITLE:

NASA/RECON WORKSHOP EVALUATION RESULTS

AUTHOR(s):

DOMINICK, WAYNE D. * TRIANTAFYLLOPOULOS, SPIROS * USL NASA/RECON WORKSHOP PARTICIPANTS

AFFILIATION:

UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:

THIS ENTRY CONTAINS THE RESPONSES OF THE USL NASA/RECON WORKSHOP

PARTICIPANTS TO THE EVALUATION QUESTIONNAIRE. ALL QUESTIONNAIRES AND COMMENTS ARE INCLUDED. ALSO INCLUDED IS A STATISTICAL ANALYSIS OF THE RESULTS AND THE COVER LETTER TO NASA, HQ.

KEYWORDS:

NASA/RECON WORKSHOP EVALUATION * RESULTS EVALUATION

CATEGORIES:

3.5 * 3.7

REFERENCE CODE: 28

JOURNAL:

DATE: 12/01/83

TITLE:

CORPORATE SOURCE AUTHORITY LIST

AUTHOR(s):

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:

THE LISTED CORPORATE SOURCES HAVE BEEN APPROVED FOR USE IN THE CUMMULATIVE INDEXES TO THE NASA ABSTRACT JOURNALS. THE CODED TERMS ARE USED IN COMPLETING THE DOCUMENT PROCESSING FORMS OR APPROVED SUBSTITUTE FORMS. THESE ABRIDGED ENTRIES HAVE BEEN DEVELOPED FROM THE FULL CORPORATE AUTHORITIES THAT APPEAR IN THE CITATIONS USED IN THE ABSTRACT SECTION.

KEYWORDS:

ABSTRACT JOURNALS * INFORMATION SOURCES * AUTHORITY LIST

CATEGORIES:

3.5 * 3.7

REFERENCE CODE: 29

JOURNAL:

DATE: 01/31/84

TITLE:

NASA/RECON WORKSHOP TRAINING MATERIAL

AUTHOR(s):

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:
THIS ENTRY INCLUDES ALL STANDARD MATERIAL PRESENTED IN A NASA/RECON WORKSHOP. IT CONTAINS COPIES OF ALL FOILS USED, HANDOUTS, POCKET GUIDES, FILE COLLECTION DETAILS AND OTHER INFORMATION RELEVANT TO THE WORKSHOP. INCLUDED ARE A COPY OF THE INTRODUCTION MATERIAL IN THE NASA/RECON USER'S MANUAL AND A COLLECTION OF ADDITIONAL HANDOUTS DISTIRBUTED AT THE U.S.L. SPECIAL TRAINING SESSION.

KEYWORDS:
NASA/RECON WORKSHOP * TRAINING MATERIAL * INFORMATION STORAGE AND RETRIEVAL

CATEGORIES:
3.5 * 3.7

REFERENCE CODE: 30

JOURNAL:

DATE: 01/31/84

TITLE:
USL NASA/RECON WORKSHOP ADMINISTRATION.

AUTHOR(s):
DOMINICK, WAYNE D. * NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA * NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:
THIS ENTRY INCLUDES ALL ADMINISTRATIVE DOCUMENTS USED PRIOR, DURING AND AFTER THE NASA/RECON WORKSHOP GIVEN AT THE UNIVERSITY OF SOUTHWESTERN LOUISIANA.

KEYWORDS:
NASA/RECON WORKSHOP * WORKSHOP ADMINISTRATION * INFORMATION STORAGE AND RETRIEVAL

CATEGORIES:
3.5 * 3.7

REFERENCE CODE: 31

JOURNAL:

DATE: 01/31/84

TITLE:

NASA/RECON WORKSHOP ADDITIONAL HANDOUTS

AUTHOR(s):

DOMINICK, WAYNE D.

AFFILIATION:

UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:

THIS ENTRY INCLUDES ALL ADDITIONAL HANDOUTS PRESENTED TO THE NASA/RECON TRAINING WORKSHOP AT THE UNIVERSITY OF SOUTHWESTERN LOUISIANA. ENTRIES INCLUDE THE WORKSHOP AGENDA AND LIST OF ATTENDEES.

KEYWORDS:

NASA/RECON WORKSHOP * TRAINING MATERIAL * ADDITIONAL HANDOUTS * ADMINISTRATION

CATEGORIES:

3.5 * 3.7

REFERENCE CODE: 32

JOURNAL:

DATE: 01/31/84

TITLE:

NASA/RECON WORKSHOP CERTIFICATES/LETTERS

AUTHOR(s):

DOMINICK, WAYNE D. * CHUM, FRANK Y.

AFFILIATION:

UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:

THIS ENTRY INCLUDES ALL CERTIFICATES ISSUED TO THE NASA/RECON TRAINING WORKSHOP ATTENDEES AT THE UNIVERSITY OF SOUTHWESTERN LOUISIANA. ENTRIES ALSO INCLUDE FOLLOW-UP LETTERS PRESENTED TO THE INSTRUCTORS AND ATTENDEES AFTER THE WORKSHOP.

KEYWORDS:

NASA/RECON WORKSHOP * CERTIFICATES OF ATTENDANCE * LETTERS TO ATTENDEES

CATEGORIES:

3.5 * 3.7

REFERENCE CODE: 33

JOURNAL:

DATE: 01/31/84

TITLE:
NASA/RECON WORKSHOP NOTES

AUTHOR(s):
DOMINICK, WAYNE D. * ATTENDEES OF THE NASA/RECON WORKSHOP AT USL

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:
THIS ENTRY INCLUDES NOTES TAKEN DURING THE NASA/RECON TRAINING WORKSHOP AT THE UNIVERSITY OF SOUTHWESTERN LOUISIANA. THESE NOTES WERE TAKEN FROM THE ATTENDEES' NOTES DURING THE WORKSHOP.

KEYWORDS:
NASA/RECON WORKSHOP * WORKSHOP NOTES

CATEGORIES:
3.5 * 3.7

REFERENCE CODE: 34

JOURNAL:

DATE: 01/31/84

TITLE:
NASA/RECON CONTRACT PUBLICITY

AUTHOR(s):
DOMINICK, WAYNE D.

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:
THIS ENTRY INCLUDES ALL PUBLICITY DOCUMENTS CONCERNING THE NASA/RECON CONTRACT AT THE UNIVERSITY OF SOUTHWESTERN LOUISIANA.

KEYWORDS:
NASA/RECON * PUBLICITY

CATEGORIES:

3.5 * 3.7

REFERENCE CODE: 35

JOURNAL:

DATE: 01/31/84

TITLE:
NASA-USL NEW COURSES INFO

AUTHOR(s):
DOMINICK, WAYNE D.

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:
THIS ENTRY INCLUDES ALL ADMINISTRATIVE DOCUMENTS RELATED TO THE
DEVELOPMENT OF NEW COURSES AT THE UNIVERSITY OF SOUTHWESTERN LOUISIANA.

KEYWORDS:
NASA/RECON * NEW COURSES * COURSE DEVELOPMENT

CATEGORIES:
3.5 * 3.7

REFERENCE CODE: 36

JOURNAL:

DATE: 01/31/84

TITLE:
NASA-RESEARCH AND DEVELOPMENT FUTURES

AUTHOR(s):
DOMINICK, WAYNE D.

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:
THIS ENTRY INCLUDES ALL ENTRIES CONCERNING FUTURE RESEARCH AND DEVELOPMENT
TOPICS WITHIN THE USL/SU NASA/RECON CONTRACT.

KEYWORDS:
NASA/RECON * RESEARCH AND DEVELOPMENT

CATEGORIES:
3.5 * 3.7

REFERENCE CODE: 37

JOURNAL:

DATE: 02/01/84

TITLE:
NASA-MISCELLANEOUS NEWS/ANNOUNCEMENTS

AUTHOR(s):
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:
THIS ENTRY INCLUDES ALL MISCELLANEOUS NEWS AND ANNOUNCEMENTS ABOUT THE
NASA/RECON USL/SU CONTRACT AND RESEARCH ACTIVITIES.

KEYWORDS:
NASA/RECON * MISCELLANEOUS NEWS * ANNOUNCEMENTS

CATEGORIES:
3.5 * 3.7

REFERENCE CODE: 38

JOURNAL:

DATE: 02/01/84

TITLE:
NASA-SPECIAL PUBLICATIONS: FUEL ECONOMY IN AVIATION

AUTHOR(s):
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:
THIS ENTRY IS A TYPICAL ENTRY OF NASA SPECIAL PUBLICATIONS. THIS BOOK
DESCRIBES ADVANCES IN RESEARCH AND DEVELOPMENT IN FUEL ECONOMY IN
AVIATION.

KEYWORDS:

NASA/RECON * SPECIAL PUBLICATIONS * FUEL ECONOMY * AVIATION

CATEGORIES:
3.5 * 3.7

REFERENCE CODE: 39

JOURNAL:

DATE: 02/15/84

TITLE:
NASA/RECON WORKSHOP EVALUATION RESULTS

AUTHOR(s):
DOMINICK, WAYNE D. * TRIANTAFYLLOPOULOS, SPIROS * USL NASA/RECON WORKSHOP PARTICIPANTS

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:
THIS ENTRY CONTAINS THE RESPONSES OF THE USL NASA/RECON WORKSHOP PARTICIPANTS TO THE EVALUATION QUESTIONNAIRE. ALL QUESTIONNAIRES AND COMMENTS ARE INCLUDED. ALSO INCLUDED IS A STATISTICAL ANALYSIS OF THE RESULTS AND THE COVER LETTER TO NASA, HQ.

KEYWORDS:
NASA/RECON WORKSHOP EVALUATION * RESULTS EVALUATION

CATEGORIES:
3.5 * 3.7

REFERENCE CODE: 40

JOURNAL:

DATE: 01/01/84

TITLE:
COMBINED FILE POSTING STATISTICS BASED ON NASA THESAURUS

AUTHOR(s):
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:

THIS ALPHABETICAL LISTING OF POSTABLE SUBJECT TERMS CONTAINED IN THE NASA THESAURUS IS USED TO DISPLAY THE NUMBER OF POSTINGS (DOCUMENTS) INDEXED BY EACH SUBJECT TERM FROM 1968 TO DATE. THE POSTING TOTALS PER TERM ARE SEPARATED BY ANNOUNCEMENT OR OTHER MEDIA INTO STAR, IAA, CSTAR, AND OTHER COLUMNAR ENTRIES COVERING THE NASA DOCUMENT COLLECTION.

KEYWORDS:

FILE STATISTICS * INFORMATION STORAGE AND RETRIEVAL * PERFORMANCE
MEASUREMENT AND EVALUATION * NASA THESAURUS

CATEGORIES:

3.51 * 3.7 * 4.6

REFERENCE CODE: 41

JOURNAL:

DATE: 01/01/84

TITLE:

GENERAL NASA CORRESPONDENCE

AUTHOR(s):

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AFFILIATION:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT:

THIS ENTRY CONTAINS GENERAL NASA/USL/SU CORRESPONDENCE RELATED TO THE NASA/RECON CONTRACT.

KEYWORDS:

NASA/RECON * CORRESPONDENCE

CATEGORIES:

3.5 * 3.7

REFERENCE CODE: 42

JOURNAL:

DATE: 03/14/84

TITLE:

NASA-PUBLICATIONS INFORMATION

AUTHOR(s):

DOMINICK, WAYNE D. * CHUM, FRANK Y. * TRIANTAFYLLOPOULOS, SPIROS

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:
THIS ENTRY IS A CATALOG OF PUBLICATIONS RELATED TO THE USL/SU NASA/RECON
CONTRACT.

KEYWORDS:
NASA/RECON * PUBLICATION LIST * DOCUMENTATION

CATEGORIES:
3.5 * 3.7

REFERENCE CODE: 43

JOURNAL:

DATE: 03/14/84

TITLE:
NASA-DIALOG INFORMATION

AUTHOR(s):
DOMINICK, WAYNE D. * CHUM, FRANK Y. * TRIANTAFYLLOPOULOS, SPIROS

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:
THIS ENTRY CONTAINS DOCUMENTS RELATED TO THE LOCKHEED DIALOG INFORMATION
STORAGE AND RETRIEVAL SYSTEM. THIS ENTRY COVERS SUBJECTS SUCH AS TRAINING,
COSTS, ACCESSIBILITY, ETC.

KEYWORDS:
DIALOG * INFORMATION STORAGE AND RETRIEVAL SYSTEMS * LOCKHEED DIALOG

CATEGORIES:
3.5 * 3.7

REFERENCE CODE: 44

JOURNAL:

DATE: 03/14/84

TITLE:
LASER PRINTER INFORMATION

AUTHOR(s):
CHUM, FRANK Y. * USL COMPUTER CENTER STAFF

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANS

ABSTRACT:
THIS ENTRY CONTAINS INFORMATION ABOUT THE USL LASER PRINTER. INCLUDED ARE
CONTROL SEGMENT EXAMPLES, AVAILABLE FONT SAMPLES, GENERAL PRINTER
INFORMATION AND FINISHED SAMPLES OF THE LASER PRINTER.

KEYWORDS:
NASA/RECON * LASER PRINTER * PRINTER * DOCUMENTATION

CATEGORIES:
3.5 * 3.7

REFERENCE CODE: 45

JOURNAL:

DATE: 03/14/84

TITLE:
NASA - LASER ORIGINALS

AUTHOR(s):
DOMINICK, WAYNE D. * CHUM, FRANK Y. * TRIANTAFYLLOPOULOS, SPIROS

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANS

ABSTRACT:
THIS ENTRY CONTAINS THE ORIGINAL COPIES OF ALL REPORTS PRODUCED BY THE USL
LASER PRINTER. ITS PURPOSE IS TO SERVE AS BACKUP FOR THESE DOCUMENTS.

KEYWORDS:
NASA/RECON * LASER PRINTER * DOCUMENTATION

CATEGORIES:
3.5 * 3.7

REFERENCE CODE: 46

JOURNAL:

DATE: 03/01/84

TITLE:

NASA GSO FUNDING REQUESTS

AUTHOR(s):
DOMINICK, WAYNE D.

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:
THIS ENTRY CONTAINS ALL CORRESPONDENCE WITH THE GRADUATE STUDENT ORGANIZATION CONCERNING FINANCIAL SUPPORT TO CMPS669 STUDENTS. THE SUPPORT IS TO BE USED FOR COVERING THE COST OF ONLINE INFORMATIONN STORAGE AND RETRIEVAL SYSTEMS.

KEYWORDS:
NASA/RECON * FUNDING REQUESTS * COURSE FINANCIAL SUPPORT

CATEGORIES:
3.5 * 3.7

REFERENCE CODE: 47

JOURNAL:

DATE: 03/07/84

TITLE:
NASA-INTERIM REPORT #1 LASER ORIGINALS

AUTHOR(s):
DOMINICK, WAYNE D. * ROQUEMORE, LEROY

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA * SOUTHERN UNIVERSITY

ABSTRACT:
THIS ENTRY CONTAINS THE ORIGINAL LASER OUTPUT FOR THE FIRST INTERIM REPORT TO NASA, HQ. ALL WORK DONE FOR THE CONTRACT SO FAR IS INCLUDED IN THIS REPORT.

KEYWORDS:
NASA/RECON * REPORT * DOCUMENTATION

CATEGORIES:
3.5 * 3.7

REFERENCE CODE: 48

JOURNAL:

DATE: 03/07/84

TITLE:
NASA-INTERIM REPORT #1 BACKUP FILE

AUTHOR(s):
DOMINICK, WAYNE D. * ROQUEMORE, LEROY

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA * SOUTHERN UNIVERSITY

ABSTRACT:
THIS ENTRY IS USED AS A BACKUP FOR THE LASER PRINTER ORIGINALS OF THE
FIRST USL/SU INTERIM REPORT TO NASA, HQ.

KEYWORDS:
NASA/RECON * REPORT * DOCUMENTATION

CATEGORIES:
3.5 * 3.7

REFERENCE CODE: 49

JOURNAL:

DATE: 03/01/84

TITLE:
NASA NEEDS ANALYSIS QUESTIONNAIRE BACKUP FILE

AUTHOR(s):
DOMINICK, WAYNE D. * CMPS669 STUDENTS

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:
THIS ENTRY CONTAINS ALL VERSIONS OF THE USL NASA/RECON NEEDS ANALYSIS
QUESTIONNAIRE PREPARED SO FAR. ALSO INCLUDED IS MULTICS MAIL WITH
SUGGESTIONS, PROPOSALS AND OTHER MATERIAL RELATING TO THE NEEDS ANALYSIS
QUESTIONNAIRE. <KEYWORDS> NASA /RECON * NEEDS ANALYSIS QUESTIONNAIRE

CATEGORIES:
3.1 * 3.5

REFERENCE CODE: 50

JOURNAL:

DATE: 04/01/84

TITLE:
NASA WORKING PAPER SERIES BACKUP FILE

AUTHOR(s):
DOMINICK, WAYNE D. * CHUM, FRANK Y.

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:
THIS ENTRY CONTAINS ALL BACKUP COPIES OF THE USL DBMS-NASA/RECON CONTRACT WORKING PAPER SERIES STANDARDS. THE VARIOUS VERSIONS OF THE STANDARDS AS THEY WERE DEVELOPED ARE INCLUDED.

KEYWORDS:
NASA RECON * USL DBMS NASA RECON WORKING PAPER SERIES * DOCUMENTATION STANDARDS

CATEGORIES:
3.1 * 3.5

REFERENCE CODE: 51

JOURNAL:

DATE: 04/01/84

TITLE:
NASA PC DOCUMENT BACKUP FILE

AUTHOR(s):
DOMINICK, WAYNE D. * TRIANTAFYLLOPOULOS, SPIROS

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:
THIS ENTRY CONTAINS BACKUP COPIES OF THE PROPOSAL SUBMITTED TO NASA CONCERNING THE PERSONAL COMPUTER VS. TERMINAL PURCHASE ISSUES. ALL VERSIONS OF THE DOCUMENT ALONG WITH THE CHANGES MADE ARE INCLUDED.

KEYWORDS:
NASA/RECON * EQUIPMENT PURCHASE * PERSONAL COMPUTERS * PC

CATEGORIES:
3.1 * 3.5

REFERENCE CODE: 52

JOURNAL:

DATE: 02/15/84

TITLE:
NASA AEDS FOILS

AUTHOR(s):
DOMINICK, WAYNE D. * ROQUEMORE, LEROY

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA * SOUTHERN UNIVERSITY

ABSTRACT:
THIS ENTRY CONTAINS THE ORIGINAL FOILS THAT WERE USED IN THE 11TH ANNUAL CONFERENCE OF THE MID-SOUTH ASSOCIATION FOR EDUCATIONAL DATA SYSTEMS (AEDS), FEBRUARY 22-25, 1984, IN NEW ORLEANS, LA. THE SUBJECT OF THE CONFERENCE PRESENTATION WAS "TRANSPORTABLE, UNIVERSITY-LEVEL EDUCATIONAL PROGRAMS IN INTERACTIVE INFORMATION STORAGE AND RETRIEVAL SYSTEMS".

KEYWORDS:
NASA/RECON * ASSOCIATION FOR EDUCATIONAL DATA SYSTEMS * AEDS * EDUCATION

CATEGORIES:
3.1 * 3.5

REFERENCE CODE: 53

JOURNAL:

DATE: 03/01/84

TITLE:
NASA OCLC USER INTERFACE SIMULATOR

AUTHOR(s):
DOMINICK, WAYNE D.

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:
THIS ENTRY CONTAINS GENERAL CORRESPONDENCE BETWEEN THE USL NASA/RECON CONTRACT TEAM AND OCLC, INC., CONCERNING THE DEVELOPMENT OF INFORMATION SYSTEM SIMULATORS.

KEYWORDS:
NASA/RECON * OCLC * INFORMATION SYSTEMS SIMULATION * INFORMATION SYSTEMS *

SYSTEMS SIMULATION

CATEGORIES:

3.1 * 3.5 * 4.3

REFERENCE CODE: 54

JOURNAL:

DATE: 02/29/84

TITLE:

INTERIM REPORT NUMBER 1 NASA CONTRACT NUMBER NASW-3846

AUTHOR(s):

DOMINICK, WAYNE D. * ROQUEMORE, LEROY

AFFILIATION:

UNIVERSITY OF SOUTHWESTERN LOUISIANA * SOUTHERN UNIVERSITY

ABSTRACT:

THIS IS INTERIM REPORT NUMBER 1 THAT WAS SUBMITTED TO NASA, HQ, FOR THE USL/SU NASA/RECON CONTRACT. ENCLOSED ARE THE FOLLOWING DOCUMENTS: (A.) PRE-CONTRACT NASA MEETING HANDOUTS (B.) PRE-CONTRACT NASA MEETING NOTES (C.) USL NASA TASK/STATUS PROJECT MANAGEMENT AND CONTROL REPORT (D.) SU NASA TASK/STATUS PROJECT MANAGEMENT AND CONTROL REPORT (E.) USL COMPUTER SCIENCE DEPARTMENT COURSE CMPS669 "ADVANCED TOPICS IN COMPUTER-BASED INFORMATION SYSTEMS (NASA RECON)" COURSE SYLLABUS, SPRING 1984 (F.) USL CMPS669 STUDENT TASKS/ASSIGNMENTS TASKING SPECIFICATIONS DOCUMENT (G.) USL DBMS R&D PROJECT NASA/RECON MULTICS DIRECTORY STRUCTURE (H.) USL DBMS NASA/RECON BIBLIOGRAPHIC SUPPORT DATA BASE (I.) NASA/RECON SPECIAL TRAINING WORKSHOP AT USL: WORKSHOP AGENDA, LIST OF PARTICIPANTS, AND COMPLETION CERTIFICATES (J.) NASA/RECON SPECIAL TRAINING WORKSHOP AT USL: PARTICIPANTS EVALUATION FORM SUMMARY RESULTS (K.) NASA CONTRACT PRESENTATION VISUALS FOR THE 11TH ANNUAL CONFERENCE OF THE MID-SOUTH ASSOCIATION OF EDUCATIONAL DATA SYSTEMS (L.) "OVERVIEW OF THE NASA/RECON EDUCATIONAL, RESEARCH, AND DEVELOPMENT ACTIVITIES OF THE COMPUTER SCIENCE DEPARTMENTS OF THE UNIVERSITY OF SOUTHWESTERN LOUISIANA AND SOUTHERN UNIVERSITY", WAYNE D. DOMINICK, USL/DBMS NASA/RECON WORKING PAPER SERIES REPORT NUMBER DBMS.NASA/RECON-1. (M.) "NASA RECON: COURSE DEVELOPMENT, ADMINISTRATION, AND EVALUATION," WAYNE D. DOMINICK AND LEROY ROQUEMORE, USL/DBMS NASA/RECON WORKING PAPER SERIES REPORT NUMBER DBMS.NASA/RECON-2. (N.) "TRANSPORTABLE, UNIVERSITY-LEVEL EDUCATIONAL PROGRAMS IN INTERACTIVE INFORMATION STORAGE AND RETRIEVAL SYSTEMS," WAYNE D. DOMINICK AND LEROY ROQUEMORE, USL/DBMS NASA/RECON WORKING PAPER SERIES REPORT NUMBER DBMS.NASA/RECON-3.

KEYWORDS:

NASA/RECON * INFORMATION STORAGE AND RETRIEVAL SYSTEMS * INTERIM REPORT TO NASA * ACTIVITIES REPORT

CATEGORIES:
3.1 * 3.4 * 4.32

REFERENCE CODE: 55

JOURNAL:

DATE: 01/22/84

TITLE:
NASA USL STATUS REPORTS VOL. 1

AUTHOR(s):
DOMINICK, WAYNE D.

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

ABSTRACT:
THIS ENTRY CONTAINS ALL STATUS REPORTS TO SOUTHERN UNIVERSITY FROM USL.

KEYWORDS:
NASA/RECON * INFORMATION STORAGE AND RETRIEVAL SYSTEMS * REPORT TO NASA *
ACTIVITIES REPORT

CATEGORIES:
3.1 * 3.4 * 4.32

ATTACHMENT 6.8

USL DBMS IS&R BIBLIOGRAPHIC
SUPPORT DATA BASE STATUS

NASA.IS&R OUTPUT (08/01/84, 2147.56)

REFERENCE CODE: 1
DATE: 1983

TITLE:
COMPUTATIONAL MODELS OF DISCOURSES

AUTHOR(S):
BRADY, MICHAEL * BERWICK, ROBERT C.

AFFILIATION:
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

PUBLISHER:
MASSACHUSETTS INSTITUTE OF TECHNOLOGY PRESS

REFERENCE CODE: 2
DATE: 1980

TITLE:
MADAM USERS' GUIDE, VOLUME I

AUTHOR(S):
DOMINICK, W. D. * MICHELSON, C. D. * FAROOQ, M. U.

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

PUBLISHER:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

REFERENCE CODE: 3
DATE: 1980

TITLE:
MADAM USERS' GUIDE, VOLUME II

AUTHOR(S):

DOMINICK, W. D. * MICHELSEN, C. D. * FAROOQ, M. U.

AFFILIATION:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

PUBLISHER:
UNIVERSITY OF SOUTHWESTERN LOUISIANA

REFERENCE CODE: 4

JOURNAL:
JASIS
VOLUME: 34
ISSUE: 3
DATE: MAY 1983
PAGES: 163 - 180

TITLE:
FACTORS AFFECTING ONLINE BIBLIOGRAPHIC RETRIEVAL: A
CONCEPTUAL FRAMEWORK FOR RESEARCH

AUTHOR(s):
FIDEL, R. * SOERGEL, D.

AFFILIATION:
UNIVERSITY OF MARYLAND

ABSTRACT:
THIS ARTICLE PRESENTS A CONCEPTUAL FRAMEWORK FOR THE
ORGANIZATION OF FACTORS AFFECTING ONLINE BIBLIOGRAPHIC
RETRIEVAL; THE VARIABLES WERE COLLECTED FROM MAJOR SOURCE.
THE FIRST PART DESCRIBES THE VARIOUS ROLES THAT VARIABLES
PLAY IN A RESEARCH STUDY. THE SECOND PART GIVES A CONCEPTUAL
FRAMEWORK FOR THE FACTORS WITH EXAMPLES OF INDIVIDUAL
VARIABLES FOR ILLUSTRATION. WE CONSIDER THE FOLLOWING
ELEMENTS OF THE TOTAL RETRIEVAL SITUATION: THE SETTING, THE
USER, THE REQUEST, THE DATABASE, THE SEARCH SYSTEM, THE
SEARCHER, THE SEARCH PROCESS, AND THE SEARCH OUTCOME.

KEYWORDS:
BIBLIOGRAPHIC RETRIEVAL * ONLINE SEARCH * DATABASE *
INDEPENDENT VARIABLE * DEPENDENT VARIABLE * SEARCH SYSTEM *
SEARCHING * SEARCH STRATEGY

CATEGORIES:
3.74 * 3.8

REFERENCE CODE: 5
DATE: 1983

TITLE:
DATA BASE MANAGEMENT: THEORY AND APPLICATIONS

AUTHOR(S):
HOLSAPPLE, CLYDE W. * WHINSTON, A. B.

AFFILIATION:
UNIVERSITY OF ILLINOIS * PURDUE UNIVERSITY

PUBLISHER:
D. REIDER

REFERENCE CODE: 6
DATE: 1974

TITLE:
DATA BASE MANAGEMENT

AUTHOR(S):
KLIMBIE, J. W. * KOFFEMANN, K. L.

AFFILIATION:

PUBLISHER:
NORTH-HOLLAND PUBLISHING COMPANY

REFERENCE CODE: 7
DATE: 1973

TITLE:
THE ART OF COMPUTER PROGRAMMING

AUTHOR(S):
KNUTH, D. E.

AFFILIATION:
STANFORD UNIVERSITY

PUBLISHER:
ADDISON-WESLEY PUBLISHING COMPANY

REFERENCE CODE: 8
DATE: 1968

TITLE:

INFORMATION RETRIEVAL SYSTEMS: ONLINE

AUTHOR(S):
LANCASTER, F. W.

AFFILIATION:
UNIVERSITY OF ILLINOIS

PUBLISHER:
WILEY-BECKER-HAYES

REFERENCE CODE: 9
DATE: 1969

TITLE:
FILE STRUCTURES FOR ON-LINE SYSTEMS

AUTHOR(S):
LEFKOVITZ, D.

AFFILIATION:
UNIVERSITY OF PENNSYLVANIA * COMPUTER COMMAND AND CONTROL
COMPANY

PUBLISHER:
SPARTAN BOOKS

REFERENCE CODE: 10
DATE: 1981

TITLE:
THE ANALYSIS, DESIGN, AND IMPLEMENTATION OF INFORMATION
SYSTEM(2ND ED.)

AUTHOR(S):
LUCAS, H. C., JR.

AFFILIATION:
NEW YORK UNIVERSITY

PUBLISHER:
MCGRAW-HILL

REFERENCE CODE: 11
DATE: 1977

TITLE:

COMPUTER DATA BASE ORGANIZATION

AUTHOR(S):
MARTIN, JAMES

AFFILIATION:
IBM SYSTEMS RESEARCH INSTITUTE

PUBLISHER:
PRENTICE-HALL

REFERENCE CODE: 12
DATE: 1973

TITLE:
DESIGN OF MAN-COMPUTER DIALOGUES

AUTHOR(S):
MARTIN, JAMES

AFFILIATION:
IBM SYSTEMS RESEARCH INSTITUTE

PUBLISHER:
PRENTICE-HALL

REFERENCE CODE: 13
DATE: 1982

TITLE:
APPLICATION DEVELOPMENT WITHOUT PROGRAMMERS

AUTHOR(S):
MARTIN, JAMES

AFFILIATION:
IBM SYSTEMS RESEARCH INSTITUTE

PUBLISHER:
PRENTICE-HALL

REFERENCE CODE: 14
DATE: SEPTEMBER 1974

TITLE:
A FEATURE ANALYSIS OF INTERACTIVE RETRIEVAL SYSTEMS

AUTHOR(S):
MARTIN, THOMAS H.

AFFILIATION:
STANFORD UNIVERSITY

PUBLISHER:
NATIONAL TECHNICAL INFORMATION SERVICES

REFERENCE CODE: 15
DATE: APRIL 1979

TITLE:
EXPERIMENTS AND ANALYSIS ON A COMPUTER INTERFACE TO AN
INFORMATION-RETRIEVAL NETWORK

AUTHOR(S):
MARCUS, R. S. * REINTJES, J. F.

AFFILIATION:
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

PUBLISHER:
MASSACHUSETTS INSTITUTE OF TECHNOLOGY PRESS

REFERENCE CODE: 16
DATE: 1978

TITLE:
A SEMANTIC DATA BASE MODEL AND ITS ASSOCIATED STRUCTURED
USER INTERFACE

AUTHOR(S):
MCLEOD, DENNIS

AFFILIATION:
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

PUBLISHER:
COMPUTER SCIENCE LABORATORY, MASSACHUSETTS INSTITUTE OF
TECHNOLOGY

REFERENCE CODE: 17
DATE: 1973

TITLE:
THE ANALYSIS OF INFORMATION SYSTEMS

AUTHOR(S):
MEADOW, C. T.

AFFILIATION:
DREXEL UNIVERSITY

PUBLISHER:
WILEY-MELVILLE PUBLISHING COMPANY

REFERENCE CODE: 18

JOURNAL:
ACM-SIGIR
VOLUME: 12
ISSUE: 2
DATE: 1977
PAGES: 12 - 108

TITLE:
INFORMATION STORAGE AND RETRIEVAL: A SURVEY AND FUNCTIONAL
DESCRIPTION

AUTHOR(s):
MINKER, J.

AFFILIATION:
UNIVERSITY OF MARYLAND

ABSTRACT:
INFORMATION STORAGE AND RETRIEVAL ENCOMPASSES A BROAD SCOPE
OF TOPICS RANGING FROM BASIC TECHNIQUES FOR ACCESSING DATA
TO SOPHISTICATED APPROACHES FOR THE ANALYSIS OF NATURAL
LANGUAGE TEXT AND THE DEDUCTION OF INFORMATION. WITHIN THE
FIELD, THREE GENERAL AREAS OF INVESTIGATION CAN BE
DISTINGUISHED NOT ONLY BY THEIR SUBJECT MATTER BUT ALSO BY
THE TYPES OF INDIVIDUALS PRESENTLY INTERESTED IN THEM: (1)
DOCUMENT RETRIEVAL, (2) GENERALIZED DATA MANAGEMENT, AND (3)
QUESTION-ANSWERING. A FUNCTIONAL DESCRIPTION WHICH APPLIES
TO EACH OF THE THREE AREAS IS PRESENTED TOGETHER WITH A
SURVEY OF WORK BEING CONDUCTED. THE SIMILARITIES AND
DIFFERENCES OF THE THREE AREAS OF IS&R ARE DESCRIBED.

KEYWORDS:
INFORMATION RETRIEVAL * DATA MANAGEMENT * RELATIONAL DATA
SYSTEMS * QUESTION-ANSWERING * NATURAL LANGUAGE * DEDUCTIVE
SEARCH * PROBLEM SOLVING * DATA STRUCTURES * THEOREM PROVING
* AUTOMATIC INDEXING

CATEGORIES:
3.51 * 3.7 * 4.2 * 4.34 * 5.6

REFERENCE CODE: 19

DATE: 1982

TITLE:

DESIGN OF COMPUTER DATA FILES

AUTHOR(S):

HANSON, OWEN

AFFILIATION:

CITY UNIVERSITY, LONDON

PUBLISHER:

COMPUTER SCIENCE PRESS

REFERENCE CODE: 20

JOURNAL:

JASIS

VOLUME: 31

ISSUE: 2

DATE: MARCH 1980

PAGES: 97 - 104

TITLE:

EDUCATION AND TRAINING FOR COMPUTER-BASED REFERENCE
SERVICES: A CASE STUDY

AUTHOR(s):

ROBINSON, J.

AFFILIATION:

LAWRENCE BERKERLY LABORATORY

ABSTRACT:

THIS ARTICLE DISCUSSES A TRAINING PROGRAM FOR ON-LINE
SEARCHING THAT WAS USED BY THE UNIVERSITY OF CALIFORNIA'S
COMPUTERIZED INFORMATION SYSTEM (CIS). AFTER GIVING AN
OVERVIEW OF THE TRAINING PROGRAM AS A WHOLE, IT CONCENTRATES
ON DATABASE TRAINING. ONE FORM OF INTENSIVE DATABASE
TRAINING IS THE DATABASE WORKSHOP, PRESENTED BY THE DATABASE
SUPPLIER STAFF. A SECOND FORM IS THE DATABASE SEMINAR, WHERE
SEARCHERS INVESTIGATE TOPICS ON DIVERSE DATABASES AND SYSTEM
AND THEN REPORT TO EACH OTHER IN AN INFORMAL SETTING. THIS
PROVED TO BE A POPULAR AND COST-EFFECTIVE TRAINING
TECHNIQUE, ESPECIALLY FOR SEARCH STRATEGY. THE TWO KINDS OF
DATABASE TRAINING SEEM TO COMPLEMENT EACH OTHER.

KEYWORDS:
COMPUTERIZED INFORMATION SYSTEM * DATABASE * SEARCH STRATEGY
* AUDIENCE * ON-LINE SEARCH * DATABASE WORKSHOP

CATEGORIES:
3.51 * 3.74 * 4.33

REFERENCE CODE: 21
DATE: 1977

TITLE:
DATA BASE ORGANIZATION FOR DATA MANAGEMENT

AUTHOR(S):
GHOSH, SAKTI P.

AFFILIATION:
IBM RESEARCH LIBRARY

PUBLISHER:
ACADEMIC PRESS

REFERENCE CODE: 22
DATE: 1980

TITLE:
HUMAN INTERACTION WITH COMPUTERS

AUTHOR(S):
SMITH, H. T. * GREEN, T. R. G.

AFFILIATION:
UNIVERSITY OF NOTTINGHAM * UNIVERSITY OF SHEFFIELD

PUBLISHER:
ACADEMIC PRESS

REFERENCE CODE: 23
DATE: 1982

TITLE:
DESIGN OF DATABASE STRUCTURES

AUTHOR(S):
TEOREY, T. J. * FRY, J. P.

AFFILIATION:

KEYWORDS:
COMPUTERIZED INFORMATION SYSTEM * DATABASE * SEARCH STRATEGY
* AUDIENCE * ON-LINE SEARCH * DATABASE WORKSHOP

CATEGORIES:
3.51 * 3.74 * 4.33

REFERENCE CODE: 21
DATE: 1977

TITLE:
DATA BASE ORGANIZATION FOR DATA MANAGEMENT

AUTHOR(S):
GHOSH, SAKTI P.

AFFILIATION:
IBM RESEARCH LIBRARY

PUBLISHER:
ACADEMIC PRESS

REFERENCE CODE: 22
DATE: 1980

TITLE:
HUMAN INTERACTION WITH COMPUTERS

AUTHOR(S):
SMITH, H. T. * GREEN, T. R. G.

AFFILIATION:
UNIVERSITY OF NOTTINGHAM * UNIVERSITY OF SHEFFIELD

PUBLISHER:
ACADEMIC PRESS

REFERENCE CODE: 23
DATE: 1982

TITLE:
DESIGN OF DATABASE STRUCTURES

AUTHOR(S):
TEOREY, T. J. * FRY, J. P.

AFFILIATION:

UNIVERSITY OF MICHIGAN

PUBLISHER:
PRENTICE-HALL

REFERENCE CODE: 24
DATE: 1977

TITLE:
DATA BASE MANAGEMENT SYSTEMS

AUTHOR(S):
TSICHRITZIS, DIONYSIOS * LOCHOVSKY, F. H.

AFFILIATION:
UNIVERSITY OF TORONTO

PUBLISHER:
ACADEMIC PRESS

REFERENCE CODE: 25

JOURNAL:
JASIS
VOLUME: 31
ISSUE: 3
DATE: MAY 1980
PAGES: 155 - 160

TITLE:
NONBIBLIOGRAPHIC ON-LINE DATA BASE SERVICES

AUTHOR(s):
WANGER, J. * LANDAU, R. N.

AFFILIATION:
CUADRA ASSOCIATES

ABSTRACT:
OVER 400 DATABASES ARE AVAILABLE ON-LINE, AND THE MAJORITY OF THESE ARE NONBIBLIOGRAPHIC. THE NONBIBLIOGRAPHIC AREA ENCOMPASSES A NUMBER OF DIFFERENT TYPES OF DATABASES, INCLUDING REFERRAL, NUMERIC, TEXTUAL-NUMERIC, CHEMICAL AND PHYSICAL PROPERTIES, AND FULL-TEXT. THE GROWTH IN NONBIBLIOGRAPHIC DATABASE SERVICES HAS BEEN NOT NEARLY AS VISIBLE TO INFORMATION SPECIALISTS AS THE GROWTH IN BIBLIOGRAPHIC ONLINE DATABASE SERVICES. ONE REASON FOR THIS IS THAT THE SERVICES ARE PRIMARILY BEING MARKETED TO AND USED BY END USERS, WITH LIBRARIES AND INFORMATION CENTERS

LARGELY BEING BYPASSED. SOME NONBIBLIOGRAPHIC DATABASE SERVICES ARE END-USER ORIENTED, BUT THERE ARE MANY OTHERS IN IMPROVING AND EXTENDING TRADITIONAL REFERENCE AND OTHER LIBRARY AND INFORMATION SERVICES.

KEYWORDS:

BIBLIOGRAPHIC DATABASE * REFERRAL DATABASE * NUMERIC *
TEXTUAL-NUMERIC * REFERENCE DATABASE * SOURCE DATABASE *
DIRECTORY * GENERALIZED SYSTEM

CATEGORIES:

2 * 3.51 * 3.7 * 3.81 * 4.33

REFERENCE CODE: 26

DATE: 1983

TITLE:

DATA BASE DESIGN(2ND ED.)

AUTHOR(S):

WIEDERHOLD, G.

AFFILIATION:

STANFORD UNIVERSITY

PUBLISHER:

MCGRAW-HILL

REFERENCE CODE: 27

JOURNAL:

IBM SYSTEMS JOURNAL

VOLUME: 16

ISSUE: 4

DATE: 1977

PAGES: 324 - 343

TITLE:

QUERY-BY-EXAMPLE: A DATA BASE LANGUAGE

AUTHOR(s):

ZLOOF, MOSHE M.

ABSTRACT:

THIS PAPER IS ALMOST A USER'S GUIDE FOR THE QUERY-BY-EXAMPLE DATABASE LANGUAGE. THE RETRIEVAL, MANIPULATION, AND DEFINITION FEATURES OF THIS SYSTEM ARE ILLUSTRATED BY AN EXTENSIVE SERIES OF INCREMENTAL EXAMPLES. THIS PAPER IS WRITTEN TOTALLY FROM THE USERS' POINT OF VIEW. THE TECHNICAL

ISSUE: 6
DATE: AUGUST 1983
PAGES: 28 - 29

TITLE:
ONLINE AGE: ASSESSMENT & DIRECTION

AUTHOR(s):
NEWMAN, L.

AFFILIATION:
UNIVERSITY OF CINCINNATI

ABSTRACT:
THIS ARTICLE DISCUSSED THE ISSUE OF WHO THE INFORMATION
SPECIALISTS ARE AND HOW THEY SHOULD BE EDUCATED AND TRAINED.

KEYWORDS:
INFORMATION SPECIALIST * END USER * DATABASES * ONLINE
INFORMATION SERVICE

CATEGORIES:
2.2 * 3.7 * 4.33

REFERENCE CODE: 30

JOURNAL:
JASIS
VOLUME: 31
ISSUE: 3
DATE: MAY 1980
PAGES: 161 - 170

TITLE:
ON-LINE SYSTEMS OF DISCIPLINES AND SPECIALTY AREA IN SCIENCE
AND TECHNOLOGY

AUTHOR(s):
REGAZZI, J. J. * BENNION, B. * ROBERTS, S.

AFFILIATION:
RUTGERS UNIVERSITY * USC * AMERICAN MEDICAL ASSOCIATION

ABSTRACT:
OVER 130 ON-LINE BIBLIOGRAPHIC DATABASES IN SCIENCE AND
TECHNOLOGY, AVAILABLE THROUGH COMMON VENDORS AS OF DECEMBER
1979. ARE IDENTIFIED AND REVIEWED. THESE HAVE BEEN
CLASSIFIED AS (1) DISCIPLINE-WIDE, TRANSDISCIPLINARY, OR
MULTIDISCIPLINARY AND (2) SPECIALTY OR PROBLEM-ORIENTED.
SELECTED DATABASES OF BOTH TYPES ARE DISCUSSED, INCLUDING
AREAS COVERED AND FUNCTIONS SERVED.

KEYWORDS:

ON-LINE DATABASES * VENDOR CONSIDERATIONS * INFORMATION
STORAGE & RETRIEVAL

CATEGORIES:

3.7 * 3.81 * 4.33

REFERENCE CODE: 31

JOURNAL:

COMPUTER MANAGEMENT

DATE: MAY 1983

PAGES: 25 - 28

TITLE:

DATA MANAGEMENT

AUTHOR(s):

MANCHESTER, P.

ABSTRACT:

THE POWER OF DATA DEPENDS VERY MUCH ON HOW IT HAS BEEN
STORED. THE AUTHOR REPORTS ON THE LATEST TECHNIQUES OF
ORGANIZING INFORMATION

KEYWORDS:

DATA STORAGE * DATA STRUCTURES * FILE ORGANIZATION

CATEGORIES:

4.34 * 5.6

REFERENCE CODE: 32

JOURNAL:

COMPUTING & ELECTRICAL ENGRINEERING

VOLUME: 10

ISSUE: 1

DATE: 1983

PAGES: 3 - 9

TITLE:

A COMPARISON OF PROCESSING TIMES FOR UPDATE REQUESTS IN TWO
LOCKING SCHEMES

AUTHOR(s):

FUNG, K.T. * LAM, C.M.

AFFILIATION:

AMERICAN BELL

ABSTRACT:

MODELS ARE DEVELOPED FOR THE PRIMARY SITE AND THE PRIMARY COPY LOCKING SCHEMES FOR CONCURRENCY CONTROL IN DISTRIBUTED DATABASES. THESE MODELS ARE THEN ANALYZES TO OBTAIN ANALYTIC RESULTS, WHICH ENABLE ONE TO CONVENIENTLY MAKE COMPARISONS OF TWO LOCKING SCHEMES IN TERMS OF THEIR PROCESSING TIMES FOR UPDATE REQUESTS AS WELL AS OTHER DESIGN DECISIONS. THE ANALYSIS FOLLOWS AN APPROACH BASED ON A SYSTEMATIC ASSIGNMENT OF COMPARABLE VALUES TO CORRESPONDING PARAMETERS IN THE TWO MODELS.

KEYWORDS:

DATABASES * SYSTEMS DESIGN * SYSTEMS EVALUATION *
DISTRIBUTED DATABASES

CATEGORIES:

3.72 * 4.33

REFERENCE CODE: 33

JOURNAL:

REFERENCE LIBRARY

DATE: 1982

PAGES: 143 - 53

TITLE:

FREE-TEXT SEARCHING OF ONLINE DATABASES

AUTHOR(s):

KNAPP, S. D.

AFFILIATION:

STATE UNIVERSITY OF NEW YORK

ABSTRACT:

THIS ARTICLE OFFERS HINTS ON IMPROVEMENT OF FREE-TEXT SEARCHING SKILLS AND DISCUSSES THE MAIN PROBLEMS OF SEARCH, SOURCES OF FREE-TEXT TERMS, AND STRATEGIES FOR FINDING TERMS ON LINE.

KEYWORDS:

SEARCHING * ONLINE INFORMATION * DATABASE * SEARCH STRATEGIES

CATEGORIES:

3.51 * 3.72 * 3.74 * 3.8 * 4.33

REFERENCE CODE: 34

JOURNAL:
REFERENCE LIBRARY
DATE: 1982
PAGES: 155 - 163

TITLE:
EFFECTIVE ONLINE LITERATURE SEARCHING

AUTHOR(s):
MCMARTIN, M. L.

AFFILIATION:
UNIVERSITY OF VIRGINIA

ABSTRACT:
THE ARTICLE REVIEWS FACTORS WHICH AFFECT ONLINE SEARCHING, AND ESPECIALLY THE PREPARATION OF A SEARCH STRATEGY. IT ALSO DISCUSSES SEARCH TRAINING, SEARCH AIDS AND REQUEST FORMS, INTERVIEWING AND PROFILE CONSTRUCTION, SEARCH EVALUATION, AND DOCUMENT DELIVERY. PROFESSIONAL READING FOR THE SEARCH ANALYST IS LISTED.

KEYWORDS:
SEARCHING * ONLINE INFORMATION * DATABASE * USER'S BEHAVIOR
* SEARCH AIDS * SEARCH STRATEGY

CATEGORIES:
3.51 * 3.74 * 3.8

REFERENCE CODE: 35

JOURNAL:
REFERENCE LIBRARY
DATE: 1982
PAGES: 173 - 80

TITLE:
ONLINE AND MANUAL SEARCHES: A COMPARISON

AUTHOR(s):
SHUMAN, B. A.

AFFILIATION:
QUEENS COLLEGE * UNIVERSITY OF NEW YORK

ABSTRACT:
THIS ARTICLE DISCUSSES THE RESULTS OF A YEAR-LONG EXPERIMENT USING 25 STUDENTS ENROLLED IN A GRADUATE-LEVEL DATABASE REFERENCE COURSE. PSYCHOLOGICAL FACTORS ARE FOUND TO DEPEND ON THE INDIVIDUAL AND ON THE SYSTEM HARDWARE AND SOFTWARE.

KEYWORDS:

DATABASE * SEARCHING * ONLINE INFORMATION * USER'S BEHAVIOR
* HARDWARE * SOFTWARE

CATEGORIES:

2.1 * 3.36 * 3.51 * 3.74

REFERENCE CODE: 36

JOURNAL:

REFERENCE LIBRARY

DATE: 1982

PAGES: 187 - 94

TITLE:

DATABASE CHOICE: A PRACTICAL ASSESSMENT

AUTHOR(s):

HALPERIN, M.

AFFILIATION:

DREXEL UNIVERSITY

ABSTRACT:

THE DATABASE SELECTION PROCESS IS EXAMINED WITH THE AID OF
FLOWCHARTS, AND DATABASE DESCRIPTIONS ARE COMPARED. THE
PRE-SEARCH FOR THE RELEVANT FILE IS LIKENED TO ONLINE SEARCH
FOR THE RELEVANT CITATION. AIDS TO CONSTRUCTION OF A SEARCH
STRATEGY ARE SUGGESTED.

KEYWORDS:

SEARCHING * SEARCH AIDS * DATABASE * ONLINE INFORMATION *
SEARCH STRATEGY * SYSTEM EVALUATION

CATEGORIES:

3.74 * 3.8 * 5.6 * 4.9

REFERENCE CODE: 37

JOURNAL:

J. MICROGR.

VOLUME: 16

ISSUE: 1

DATE: JANUARY 1983

PAGES: 25 - 9

TITLE:

MICROGRAPHICS: A VITAL LINK IN CAD/CAM SYSTEMS

AUTHOR(s):
RUPP, D. O.

AFFILIATION:
COLLEGE OF ST. PAUL

ABSTRACT:
THIS ARTICLE GIVES AN INTRODUCTION TO CAD/CAM SYSTEMS, AND
SHOWS HOW THEY CAN BE INTEGRATED WITH MICROGRAPHICS TO
PROVIDE A TOTAL ENGINEERING INFORMATION SYSTEM. SUCH A
SYSTEM COULD PLACE NEW DESIGN CHANGES QUICKLY IN THE HANDS
OF USERS.

KEYWORDS:
SYSTEMS DESIGN * INFORMATION SYSTEM * MICROGRAPHICS

CATEGORIES:
3.7 * 3.8 * 4.39 * 5.6 * 7.1

REFERENCE CODE: 38

JOURNAL:
ONLINE REVIEW
VOLUME: 6
ISSUE: 2
DATE: JUNE 1983
PAGES: 127 - 33

TITLE:
STUDY OF STRATEGIES USED IN ONLINE SEARCHING III. QUERY
REFINING

AUTHOR(s):
SCHRODER, J. J.

AFFILIATION:
LABORATORY FOR ELECTRONIC DEVELOPMENT OF ARMED FORCES TNO

ABSTRACT:
TWELVE DIFFERENT WAYS FOR REDUCTION OF A LARGE SET BY
REMOVAL OF IRRELEVANT OR UNWANTED ELEMENTS ARE REVIEWED.
METHODS DISCUSSED INCLUDE LOGIC REVISION, CONCEPT REVISION
AND TERMINOLOGY REVISION. EXAMPLES ARE GIVEN FOR EACH
OPTION.

KEYWORDS:
ONLINE SEARCHING * INFORMATION RETRIEVAL * CONTENT ANALYSIS

CATEGORIES:
3.71 * 3.74 * 3.8 * 5.21

REFERENCE CODE: 39

JOURNAL:
SOUTHCN '83
DATE: JANUARY 1983
PAGES: 1 * 18 * 103

TITLE:
TECHNICAL INFORMATION: COMPUTERIZED RETRIEVAL, ACQUISITION
AND USE

AUTHOR(s):
LAFFERTY, J. J.

AFFILIATION:
LITE INFORMATION SERVICE INCORPORATED

ABSTRACT:
THIS ARTICLE SHOWS THAT TO GET ONLINE IS TO BECOME THE
BENEFICIARY RATHER THAN THE VICTIM OF THE INFORMATION
EXPLOSION

KEYWORDS:
SEARCH * DIALOG * INFORMATION RETRIEVAL * DATABASE * ONLINE
INFORMATION

CATEGORIES:
3.74 * 3.8 * 4.22 * 5.2

REFERENCE CODE: 40

JOURNAL:
SOUTHCN '83
DATE: JANUARY 1983
PAGES: 18

TITLE:
INFORMATION STORAGE AND RETRIEVAL THROUGH DIALOG

AUTHOR(s):
KAMINECKI, R. M.

AFFILIATION:
DIALOG INFORMATION SERVICES INCORPORATED

ABSTRACT:
THIS ARTICLE DESCRIBES THE ONLINE SEARCH USING DIALOG WHICH
ENABLE CALLING OUT OF IRRELEVANT CITATIONS USING BOOLEAN

LOGIC OPERATORS AND, OR, AND NOT, AND GIVES SOME EXAMPLES

KEYWORDS:

SEARCH * DIALOG * INFORMATION RETRIEVAL * DATABASE * ONLINE
INFORMATION

CATEGORIES:

3.74 * 3.8 * 4.22 * 5.21

REFERENCE CODE: 41

JOURNAL:

ELECTRO '83

DATE: APRIL 19 1983

PAGES: 7

TITLE:

ONLINE ENGINEERING INFORMATION AT IBM

AUTHOR(s):

HASSLACHER, G. J.

AFFILIATION:

IBM CORPORATION

ABSTRACT:

AT IBM, ENGINEERS HAVE SEVERAL OPTIONS FOR DOING TRADITIONAL LIBRARY RESEARCH USING ONLINE INFORMATION RETRIEVAL SYSTEMS. FOR CONTINUING INFORMATION NEEDS THEY CAN SUBSCRIBE TO THE CURRENT AWARENESS SERVICE. IN CASES WHERE THE INFORMATION IS A ONE TIME NEED, ENGINEERS CAN CONDUCT THE SEARCHES ON THEIR TERMINALS, THEY CAN CALL OR VISIT THE LOCAL LIBRARY AND THE LIBRARIAN WILL CONDUCT THE SEARCH OR THEY CAN CALL ITIRC WHO WILL DO THE SEARCH. WHICH SEARCH SERVICE IS SELECTED DEPENDS ON TIME CONSIDERATIONS AND WHETHER OR NOT THE ENGINEER WOULD LIKE TO PERSONALLY CONDUCT THE SEARCH. ALL SEARCH SERVICES ARE BACKED UP BY A DOCUMENT ORDERING SERVICE. BOTH ONLINE LITERATURE SEARCHING AND DOCUMENT ORDERING SYSTEMS SHORTEN LITERATURE SEARCH TIME SIGNIFICANTLY. IT ALSO GIVES A NEATLY PREPARED BIBLIOGRAPHY FOR FUTURE REFERENCE. WHILE THERE ARE STILL CERTAIN TYPES OF INFORMATION WHICH ARE NOT YET AVAILABLE ONLINE AND CERTAIN TYPES OF QUESTIONS WHICH ARE BEST ANSWERED BY BOOKS, ONLINE INFORMATION RETRIEVAL IS THE EASIEST, FASTEST AND MOST COST EFFECTIVE WAY TO DO MANY TRADITIONAL LITERATURE SEARCHES.

KEYWORDS:

SEARCH * ONLINE INFORMATION * INFORMATION RETRIEVAL *
DATABASE

CATEGORIES:

3.51 * 3.74 * 3.8 * 4.33 * 5.6

REFERENCE CODE: 42

JOURNAL:

ELECTRO '83

DATE: APRIL 19 1983

PAGES: 11

TITLE:

A SURVEY OF ONLINE BIBLIOGRAPHIC INFORMATION DATABASE USEFUL
TO ENGINEERS

AUTHOR(s):

CAPUTO, R. P.

AFFILIATION:

DIALOG INFORMATION SERVICES INCORPORATED

ABSTRACT:

THIS ARTICLE PRESENTS A SURVEY OF ONLINE SEARCH SYSTEMS
ILLUSTRATING THE TREMENDOUS POTENTIAL SUCH SYSTEMS HAVE AND
THEIR UNQUESTIONABLE UTILITY TO THE ENGINEER AND SCIENTIST.
TODAY SUCH INFORMATION SERVICES CAN BE ACCESSED NOT ONLY
THROUGH COMPUTER TERMINALS, BUT ALSO THROUGH 'PERSONAL' OR
MICROCOMPUTERS. THE AVERAGE SEARCH TAKES LESS THAN FIVE
MINUTES AND COSTS LESS THAN TEN DOLLARS. THE SEARCH LANGUAGE
AND LOGIC EMPLOYED IS RELATIVELY SIMPLE AND 'NATURAL', AND
TRAINING IN THE USE OF THE SYSTEM IS AVAILABLE EACH WEEK IN
REGIONAL OFFICES THROUGHOUT THE WORLD

KEYWORDS:

DATABASE * SEARCH * ONLINE INFORMATION * INFORMATION
RETRIEVAL

CATEGORIES:

3.74 * 3.8 * 4.33

REFERENCE CODE: 43

JOURNAL:

IBM TECHNICAL DISCLOSURE BULLETIN

VOLUME: 25

DATE: APRIL 1983

PAGES: 5501 - 2

TITLE:

METHOD FOR MODIFYING DATABASE QUERIES

AUTHOR(s):
PULLIN, D. J. * SHARMAN, G. C.

AFFILIATION:
IBM CORPORATION

ABSTRACT:
THIS ARTICLE DESCRIBES A MECHANISM WHICH GIVES A USER THE
CAPABILITY TO SPECIFY ARBITRARY QUERY OPERATIONS WITHOUT
KNOWLEDGE OF A QUERY LANGUAGE

KEYWORDS:
DATABASE * QUERY LANGUAGES * SEARCHING

CATEGORIES:
3.75 * 3.8 * 4.29 * 4.33 * 5.6

REFERENCE CODE: 44

JOURNAL:
ACM TRANSACTIONS
VOLUME: 1
ISSUE: 2
DATE: APRIL 1983
PAGES: 143 - 58

TITLE:
DOCUMENT PROCESSING IN A RELATIONAL DATABASE SYSTEM

AUTHOR(s):
STONEBRAKER, M. * LYNN, N. * KALASH, J.

AFFILIATION:
UNIVERSITY OF CALIFORNIA, BERKERLY

ABSTRACT:
THIS PAPER CONTAINS A PROPOSAL TO ENHANCE A RELATIONAL
DATABASE MANAGER TO SUPPORT DOCUMENT PROCESSING. BASICALLY,
IT SUGGESTS SUPPORT FOR DATA ITEMS THAT ARE VARIABLE-LENGTH
STRINGS, SUPPORT FOR ORDERED RELATIONS, SUPPORT FOR
SUB-STRING OPERATIONS, AND SUPPORT FOR NEW OPERATORS THAT
CONCATENATE AND BREAK APART STRING FIELDS

KEYWORDS:
DATABASE * INFORMATION PROCESSING * RELATIONAL DATABASE *
QUERY OPERATORS

CATEGORIES:
3.7 * 4.2 * 4.33 * 5.6

REFERENCE CODE: 45

JOURNAL:
ONLINE REVIEW
VOLUME: 7
ISSUE: 4
DATE: AUGUST 1983
PAGES: 341 - 51

TITLE:
A METHODOLOGY FOR CATEGORIZING INTERNATIONAL BUSINESS
LITERATURE THROUGH ONLINE BIBLIOGRAPHIC SEARCHING

AUTHOR(s):
POPOVICH, C. J.

AFFILIATION:
OHIO STATE UNIVERSITY

ABSTRACT:
ONLINE LITERATURE SEARCHING CAN BE USED FOR CLASSIFYING THE
PROLIFERATING AND DIVERSE RESEARCH PREVALENT IN THE FIELD OF
INTERNATIONAL BUSINESS. THERE HAS BEEN MUCH RESEARCH ON HOW
TO APPLY SEARCH TERMS AND STRATEGIES TO INTERNATIONAL
BUSINESS LITERATURE IN THE MOST EFFECTIVE WAY. THE KEY
METHODOLOGY USED IN INTERNATIONAL BUSINESS LITERATURE CAN BE
SEPARATED INTO THREE TYPES-ENTERPRISE SPECIFIC, HOST COUNTRY
AND INTERNATIONAL ENVIRONMENT. THE INTERRELATIONSHIPS
BETWEEN THESE THREE CATEGORIES CAN BE EXPLOITED TO ALLOW
EFFICIENT ONLINE SEARCHING

KEYWORDS:
SEARCHING * ONLINE INFORMATION * INFORMATION RETRIEVAL *
DATABASE

CATEGORIES:
3.74 * 3.8 * 4.33 * 5.6 * 7.1

REFERENCE CODE: 46

JOURNAL:
NATIONAL ONLINE MEETING PROCESSINGS - 1983
DATE: APRIL 12 1983
PAGES: 93 - 105

TITLE:
A PRACTICAL STEMMING ALGORITHM FOR ONLINE SEARCH ASSISTANCE

AUTHOR(s):
DOSZKOCS, T. * ULMSCHNEIDER, J. E.

AFFILIATION:
NATIONAL LIBRARY OF MEDICINE

ABSTRACT:

WORD TRUNCATION IS A FAMILIAR TECHNIQUE EMPLOYED BY ONLINE SEARCHERS IN ORDER TO INCREASE RECALL IN FREE TEXT RETRIEVAL. THE USE OF TRUNCATION, HOWEVER, CAN BE MIXED BLESSING SINCE MANY WORDS STARTING WITH THE SAME ROOT ARE NOT SEMANTICALLY OR LOGICALLY RELATED. CONSEQUENTLY, ONLINE SEARCHERS OFTEN SELECT WORDS TO BE OR-ED TOGETHER FROM AN ALPHABETIC DISPLAY OF NEIGHBOURING TERMS IN THE INVERTED FILE IN ORDER TO ASSURE PRECISIONS IN THE SEARCH. AUTOMATIC STEMMING ALGORITHMS TYPICALLY FUNCTION IN A MANNER ANALOGOUS TO WORD TRUNCATION, WITH THE ADDED RISK OF WORD ROOTS BEING INCORRECTLY IDENTIFIED BY THE ALGORITHM. THIS PAPER DESCRIBES A TWO-PHASE STEMMING ALGORITHM THAT CONSISTS OF THE IDENTIFICATION OF THE WORD ROOT AND THE AUTOMATIC SELECTION OF 'WELL-FORMED' MORPHOLOGICAL WORD VARIANTS FROM THE ACTUAL INVERTED FILE ENTRIES THAT START WITH THE SAME WORD ROOT. THE ALGORITHM HAS BEEN SUCCESSFULLY USED IN AN END-USER INTERFACE TO NLMS CATLINE BOOK CATALOG FILE

KEYWORDS:

SEARCHING * ONLINE INFORMATION * INFORMATION RETRIEVAL *
QUERY ALGORITHM

CATEGORIES:

3.57 * 3.74 * 3.8 * 4.33 * 5.6

REFERENCE CODE: 47

JOURNAL:

NATIONAL ONLINE MEETING PROCESSINGS - 1983

DATE: APRIL 12 1983

PAGES: 231 - 8

TITLE:

INTERMEDIARIES, SELF-SEARCHING AND SATISFACTION

AUTHOR(s):

HURT, C. D.

AFFILIATION:

UNIVERSITY OF MONTREAL

ABSTRACT:

THE PROBLEM OF INTERMEDIARY VERSUS THE SELF SEARCHER IS EXAMINED BY INVESTIGATING THE LEVEL OF SATISFACTION WITH THE RESULTS OF SEARCHES CONDUCTED USING THE TWO METHODS. DATA WERE COLLECTED FROM TWO ACADEMIC LIBRARIES TO FILL FOUR

CATEGORIES: INTERMEDIARIES ONLY, SELF SEARCHING ONLY, AND TWO COMBINATIONS OF INTERMEDIARIES AND SELF SEARCHERS. THE HYPOTHESIS TESTED WAS THAT INTERMEDIARIES PERFORMED BETTER ON THE SATISFACTION SCALE THAN DID ANY OTHER COMBINATIONS. THE RESULTS OF TESTING INDICATED THAT THIS HYPOTHESIS COULD NOT BE REJECTED. FURTHER TESTING WAS DONE TO DETERMINE REASONS FOR THIS FAILURE TO REJECT. THE RESULTS OF THE ADDITIONAL TESTING INDICATED THAT THE MAJOR REASONS FOR LOW SATISFACTION WAS DIFFICULTY WITH PROTOCOL. THE RESULTS OF THIS STUDY HAVE SOME IMPACT ON ONLINE SEARCHING IN THE FUTURE AS WELL AS FOR THE PRESENT.

KEYWORDS:

SEARCHING * DATABASE * INFORMATION RETRIEVAL * SYSTEM DESIGN
* PERFORMANCE

CATEGORIES:

5.5 * 5.6

REFERENCE CODE: 48

JOURNAL:

JASIS

VOLUME: 34

ISSUE: 4

DATE: JUNE 1983

PAGES: 292 - 293

TITLE:

THE CORRELATION BETWEEN PERTINENCE OF CITATION DUPLICATION
IN MULTIDATABASE SEARCHES

AUTHOR(s):

NEWAY, J. M. * LANCASTER, F. W.

AFFILIATION:

UNIVERSITY OF ILLINOIS

ABSTRACT:

THE RATE OF CITATION DUPLICATION WAS EXAMINED IN THREE DATABASES: MEDICINE, BIOSIS, AND LIFE SCIENCE COLLECTION. DUPLICATE CITATIONS WERE FOUND TO BE MORE PERTINENT THAN UNIQUE CITATIONS. THE DUPLICATE CITATIONS CAME FROM A HIGHLY COMPACT LITERATURE, WHILE THOSE FROM A SINGLE DATABASE WERE VERY WIDELY SCATTERED. THE PERTINENT DUPLICATE CITATIONS WERE MORE LIKELY TO BE RETRIEVED IN SEARCHES THAT HAD MORE TERMS OVERALL, AND HAD A HIGHER PERCENTAGE OF THESAURUS TERMS, AND HAD TERMS WHICH APPEARED IN BOTH TITLE AND ABSTRACT. THESE RESULTS SUGGEST THAT THE RATE OF DUPLICATION OF CITATIONS IN MULTIDATABASE SEARCHES MAY BE USED TO RANK OUTPUT ACCORDING TO PROBABLE PERTINENCE

KEYWORDS:

DATABASE * INFORMATION RETRIEVAL * SEARCHING * SYSTEM
PERFORMANCE

CATEGORIES:

3.1 * 3.34 * 3.8 * 3.51 * 3.72 * 3.81 * 5.5 * 5.6

REFERENCE CODE: 49

JOURNAL:

JASIS

VOLUME: 34

ISSUE: 4

DATE: JULY 1983

PAGES: 262 - 280

TITLE:

AUTOMATIC QUERY FORMULATIONS IN INFORMATION RETRIEVAL

AUTHOR(s):

SALTON, G. * BUCKLEY, C. * FOX, E. A.

AFFILIATION:

CORNELL UNIVERSITY

ABSTRACT:

MODERN INFORMATION RETRIEVAL SYSTEMS ARE DESIGNED TO SUPPLY RELEVANT INFORMATION IN RESPONSE TO REQUESTS RECEIVED FROM THE USER POPULATION. IN MOST RETRIEVAL ENVIRONMENTS THE SEARCH REQUESTS CONSISTS OF KEYWORDS, OR INDEX TERMS, INTERRELATED BY APPROPRIATE BOOLEAN OPERATORS. SINCE IT IS DIFFICULT FOR UNTRAINED USERS TO GENERATE EFFECTIVE BOOLEAN SEARCH REQUESTS, TRAINED SEARCH INTERMEDIARIES ARE NORMALLY USED TO TRANSLATE ORIGINAL STATEMENTS OF USER NEED INTO USEFUL BOOLEAN SEARCH FORMULATIONS. METHODS ARE INTRODUCED IN THIS STUDY WHICH REDUCE THE ROLE OF THE SEARCH INTERMEDIARIES BY MAKING IT POSSIBLE TO GENERATE BOOLEAN SEARCH FORMULATIONS COMPLETELY AUTOMATICALLY FROM NATURAL LANGUAGE STATEMENTS PROVIDED BY THE SYSTEM PATRONS. FREQUENCY CONSIDERATIONS ARE USED AUTOMATICALLY TO GENERATE APPROPRIATE TERM COMBINATIONS AS WELL AS BOOLEAN CONNECTIVES RELATING THE TERMS. METHODS ARE COVERED TO PRODUCE AUTOMATIC QUERY FORMULATIONS BOTH IN A STANDARD BOOLEAN LOGIC SYSTEM, AS WELL AS IN AN EXTENDED BOOLEAN SYSTEM IN WHICH THE STRICT INTERPRETATION OF THE CONNECTIVES IS RELAXED. EXPERIMENTAL RESULTS ARE SUPPLIED TO EVALUATE THE EFFECTIVENESS OF THE AUTOMATIC QUERY FORMULATION PROCESS, AND METHODS ARE DESCRIBED FOR APPLYING THE AUTOMATIC QUERY FORMULATION PROCESS IN PRACTICE.

KEYWORDS:

DATA BASE * BOOLEAN SYSTEM * INFORMATION RETRIEVAL *
SEARCHING * QUERY LANGUAGE

CATEGORIES:

3.70 * 5.21 * 5.6 * 3.74

REFERENCE CODE: 50

JOURNAL:

INFORMATION PROCESSING AND MANAGEMENT

VOLUME: 19

ISSUE: 4

DATE: 1983

PAGES: 243 - 253

TITLE:

HUMAN-COMPUTER INTERACTION IN INFORMATION SEEKING TASKS

AUTHOR(s):

MOREHEAD, D. R. * ROUSE, W. B.

AFFILIATION:

GEORGE INSTITUTE OF TECHNOLOGY

ABSTRACT:

THE THIRD IN A SERIES OF EXPERIMENTS USING A SIMULATED
ONLINE BIBLIOGRAPHIC INFORMATION SEEKING ENVIRONMENT CALLED
DBASE IS DISCUSSED. VARIABLES CONSIDERED IN THE STUDY ARE
COMPUTER AIDING, AVAILABILITY OF CITATION LISTS, DATABASE
STRUCTURE, AND TYPE OF SEARCH TASKS. EFFECTS OF THESE
VARIABLES ON SIX PERFORMANCE MEASURES ARE EXAMINED USING
ANALYSIS OF VARIANCE. LINEAR DISCRIMINANT ANALYSIS PROVIDES
A MORE FINE-GRAINED ANALYSIS OF IMPORTANT PROBLEM FEATURES
AND FORMS A BASIS FOR INVESTIGATING DIFFERENCES AMONG
INDIVIDUAL SEARCHERS AND THE DYNAMIC NATURE OF INFORMATION
SEEKING TASKS.

KEYWORDS:

INFORMATION RETRIEVAL * SEARCHING * DATA BASE * SYSTEM
PERFORMANCE * STRUCTURE * SYSTEM EVALUATION * ONLINE
INFORMATION * SIMULATION

CATEGORIES:

3.74 * 4.33 * 4.34 * 8.1 * 5.6 * 5.12 * 3.72 * 3.70

REFERENCE CODE: 51

JOURNAL:

NATIONAL ONLINE MEETING PROCEEDINGS

DATE: APRIL 12 1983

PAGES: 45 - 56

TITLE:

FACULTY END-USER SEARCHING FOR BIOSIS

AUTHOR(s):

BODTKE-ROBERTS, A.

AFFILIATION:

UNIVERSITY OF CALIFORNIA

ABSTRACT:

THE RESEARCH REPORTED WAS MOTIVATED BY THE DESIRE TO KNOW WHETHER FACULTY WOULD BE ABLE TO PERFORM 'ADEQUATE' SEARCHES, WHAT TRAINING MIGHT BE APPROPRIATE AND EFFECTIVE, WHAT USE THEY WOULD MAKE OF THE ONLINE SYSTEM, WHAT COMMON PROBLEMS THEY WOULD ENCOUNTER IN SEARCHING, AND WHAT SUPPORT FACULTY MIGHT REQUIRE OF THE LIBRARY IF THEY BECAME SEARCHERS. TEN SCIENCE FACULTY FROM FIVE DEPARTMENTS AT THE UNIVERSITY OF CALIFORNIA, RIVERSIDE WERE OBSERVED AND INTERVIEWED DURING THE EIGHT MONTHS OF THE RESEARCH. ALL HAD SOME FAMILIARITY WITH THE PROCESS OF COMPUTERIZED LITERATURE SEARCHING, USUALLY BECAUSE THEY HAD BEEN PRESENT WHILE SEARCH ANALYSIS RAN SEARCHES FOR THEM

KEYWORDS:

SEARCHING * ONLINE INFORMATION * SYSTEM PERFORMANCE

CATEGORIES:

3.74 * 3.72 * 2.10

REFERENCE CODE: 52

JOURNAL:

DATABASE

VOLUME: 6

ISSUE: 3

DATE: AUGUST 1983

PAGES: 10 - 17

TITLE:

DATABASE SEARCHAIDS REVIEW. PNI SEARCH AIDS

AUTHOR(s):

GEORGE, M.

AFFILIATION:

E. R. SQUIBB & SONS, INCORPORATED

ABSTRACT:

REVIEWS USER AIDS TO THE SEARCHING OF PHARMACEUTICAL NEWS INDEX (PNI). THE USER GUIDE, SEARCH PNI IS REVIEWED TOGETHER WITH AN AUDIO CASSETTE AND WORKBOOK PACKAGE CALLED LEARN PNI.

KEYWORDS:

DATA BASE * SEARCHING

CATEGORIES:

3.74 * 4.33

REFERENCE CODE: 53

JOURNAL:

COMPUTING SURVEY

VOLUME: 15

ISSUE: 1

DATE: MARCH 1983

PAGES: 45 - 79

TITLE:

TECHNIQUES FOR STRUCTURING DATABASE RECORDS

AUTHOR(s):

MARCH, S. T.

AFFILIATION:

UNIVERSITY OF MINNESOTA

ABSTRACT:

STRUCTURING DATABASE RECORDS BY CONSIDERING DATA ITEM USAGE CAN YIELD SUBSTANTIAL EFFICIENCIES IN THE OPERATING COST OF DATABASE SYSTEMS. HOWEVER, SINCE THE NUMBER OF POSSIBLE PHYSICAL RECORD STRUCTURES FOR DATABASE OF PRACTICAL SIGNIFICANCE IS ENORMOUS, AND THEIR EVALUATION IS EXTREMELY COMPLEX, DETERMINING EFFICIENT RECORD STRUCTURES BY FULL ENUMERATION IS GENERALLY INFEASIBLE. THIS PAPER DISCUSSES THE TECHNIQUES OF MATHEMATICAL CLUSTERING, ITERATIVE GROUPING REFINEMENT, MATHEMATICAL PROGRAMMING, AND HIERARCHIC AGGREGATION WHICH CAN BE USED TO QUICKLY DETERMINE EFFICIENT RECORD STRUCTURES FOR LARGE, SHARED DATABASES.

KEYWORDS:

DATA BASE * DATA STRUCTURE * SYSTEM EVALUATION * MATHEMATIC PERFORMANCE

CATEGORIES:

3.72 * 4.33 * 4.34 * 5.19

REFERENCE CODE: 54

JOURNAL:

6TH HAWAII INTERNATIONAL CONFERENCE ON SYSTEM SCIENCE 1983

DATE: JANUARY 5 1983

PAGES: 406 - 412

TITLE:

DATA DICTIONARY DESIGN WITH AN ARTIFICIAL INTELLIGENCE MODEL

AUTHOR(s):

STURDZA, P.

AFFILIATION:

MEDICAL COLLEGE OF PENNSYLVANIA

ABSTRACT:

THE IMPLEMENTATION OF AN ARTIFICIAL INTELLIGENCE MODEL USING A COMMERCIALY AVAILABLE SYSTEM, THE IBM DATA DICTIONARY, IS DESCRIBED. THE MODEL SUPPORTING KNOWLEDGE BASES BUILT AT THE MEDICAL COLLEGE FOR PRODUCTION PURPOSES.

KEYWORDS:

DATA BASE * ARTIFICIAL INTELLIGENCE

CATEGORIES:

3.60 * 4.33

REFERENCE CODE: 55

DATE: 1978

TITLE:

INFORMATION RETRIEVAL: COMPUTATIONAL AND THEORETICAL ASPECTS

AUTHOR(S):

HEAPS, H. S.

AFFILIATION:

CONCORDIA UNIVERSITY

PUBLISHER:

ACADEMIC PRESS

REFERENCE CODE: 56

JOURNAL:

TITLE:
SYSTEMS FOR LARGE DATABASES (PUBLISHER)

AUTHOR(s):
LOCKEMANN, P. C. * NEUHOLD, E. J.

AFFILIATION:
UNIVERSITY OF KARLSRUHE * UNIVERSITY OF STUTTGART

REFERENCE CODE: 57

JOURNAL:

TITLE:

AUTHOR(s):

REFERENCE CODE: 58
DATE: 1982

TITLE:
DESIGN REVIEW METHODOLOGY FOR A DATABASE ENVIRONMENT

AUTHOR(S):
INMON, W. H. * FRIEDMAN, L. J.

AFFILIATION:

PUBLISHER:
PRENTICE-HALL

REFERENCE CODE: 59
DATE: 1983

TITLE:
RELATIONAL DATABASE SYSTEMS: ANALYSIS AND COMPARISON

AUTHOR(S):
SCHMIDT, J. W. * BRODIE, M. L.

AFFILIATION:
UNIVERSITY OF HAMBURG * COMPUTER CORPORATION OF AMERICA

PUBLISHER:
SPRINGER-VERLAG

REFERENCE CODE: 60
DATE: 1982

TITLE:
PRINCIPLES OF DATABASE SYSTEMS

AUTHOR(S):
ULLMAN, J. D.

AFFILIATION:
STANFORD UNIVERSITY

PUBLISHER:
COMPUTER SCIENCE PRESS

REFERENCE CODE: 61
DATE: 1978

TITLE:
DATABASES: IMPROVING USABILITY AND RESPONSIVENESS

AUTHOR(S):
SHNEIDERMAN, B.

AFFILIATION:
UNIVERSITY OF MARYLAND

PUBLISHER:
ACADEMIC PRESS

REFERENCE CODE: 62
DATE: 1981

TITLE:
PRACTICAL DATABASE MANAGEMENT

AUTHOR(S):
AUERBACH EDITORIAL STAFF

AFFILIATION:
AUERBACH CORPORATION

PUBLISHER:

AUERBACH

REFERENCE CODE: 63

JOURNAL:

CACM

VOLUME: 23

ISSUE: 10

DATE: OCTOBER 1980

PAGES: 556 - 563

TITLE:

THE NATURAL LANGUAGE OF INTERACTIVE SYSTEMS

AUTHOR(s):

LEGARD, H. * WHITESIDE, J. * SINGER, A. * SEYMOUR, W.

AFFILIATION:

UNIVERSITY OF MASSACHUSETTS * DIGITAL EQUIPMENT CORPORATION

ABSTRACT:

THIS PAPER STEMS FROM THE DEEP BELIEF THAT IMPROVED HUMAN ENGINEERING CAN ADD SIGNIFICANTLY TO THE ACCEPTANCE AND USE OF COMPUTER TECHNOLOGY. IN PARTICULAR, THIS PAPER DESCRIBES AN EXPERIMENT TO TEST THE HYPOTHESIS THAT CERTAIN FEATURES OF NATURAL LANGUAGE PROVIDE A USEFUL GUIDE FOR THE HUMAN ENGINEERING OF INTERACTIVE COMMAND LANGUAGES. THE GOAL WAS TO ESTABLISH THAT A SYNTAX EMPLOYING FAMILIAR, DESCRIPTIVE, EVERYDAY WORDS AND WELL-FORMED ENGLISH PHRASES CONTRIBUTES TO A LANGUAGE THAT CAN BE EASILY AND EFFECTIVELY USED. USERS WITH VARYING DEGREES OF INTERACTIVE COMPUTING EXPERIENCE USED TWO VERSIONS OF AN INTERACTIVE TEXT EDITOR; ONE WITH AN ENGLISH-BASED COMMAND SYNTAX IN THE SENSE DESCRIBED ABOVE, THE OTHER WITH A MORE NOTATIONAL SYNTAX. PERFORMANCE DIFFERENCES STRONGLY FAVORED THE ENGLISH-BASED EDITOR.

KEYWORDS:

HUMAN ENGINEERING * INTERACTIVE LANGUAGE * COMMAND LANGUAGES
* PSYCHOLOGY OF COMPUTER USE

CATEGORIES:

3.36 * 4.6

REFERENCE CODE: 64

JOURNAL:

CACM

VOLUME: 23

ISSUE: 10

DATE: OCTOBER 1980
PAGES: 584 - 593

TITLE:
ANALYSIS OF LOCKING POLICIES IN DATABASE MANAGEMENT SYSTEMS

AUTHOR(s):
POTIER, D. * LEBLANC, P.

AFFILIATION:
INRIA, FRANCE

ABSTRACT:
CONSISTENCY CONTROL HAS TO BE ENFORCED IN DATABASE MANAGEMENT SYSTEMS (DBMS) WHERE SEVERAL TRANSACTIONS MAY CONCURRENTLY ACCESS THE DATABASE. THIS CONTROL IS USUALLY ACHIEVED BY DIVIDING THE DATABASE INTO LOCKING UNITS OR GRANULES, AND BY SPECIFYING A LOCKING POLICY WHICH ENSURES INTEGRITY OF THE INFORMATION. HOWEVER, A DRAWBACK OF INTEGRITY ENFORCEMENT THROUGH LOCKING POLICIES IS THE DEGRADATION OF THE GLOBAL SYSTEM PERFORMANCE. THIS IS MAINLY DUE TO THE RESTRICTION IMPOSED BY THE LOCKING POLICIES TO THE ACCESS OF TRANSACTIONS TO THE DATABASE, AND TO THE OVERHEADS INVOLVED WITH THE MANAGEMENT OF LOCKS. A FRAMEWORK FOR THE QUANTITATIVE ANALYSIS OF THE IMPACT OF THESE FACTORS ON THE PERFORMANCE OF DBMS IS PRESENTED IN THIS PAPER. IN A FIRST STEP, THE MAIN FACTORS WHICH DETERMINE THE BEHAVIOR OF THESE SYSTEMS ARE POINTED OUT AND ANALYZED INDEPENDENTLY. THE RESULTS HEREBY OBTAINED ARE AGGREGATED IN A SECOND STEP TO YIELD A GLOBAL PERFORMANCE EVALUATION. THROUGHOUT THIS HIERARCHICAL MODELING APPROACH VARIOUS ANALYTICAL TECHNIQUES ARE USED AND THE RESULTS ARE ILLUSTRATED BY NUMERICAL EXAMPLES. THE PAPER CONCLUDES BY POINTING OUT THE FINAL RESULTS' SENSITIVITY TO SOME BASIC ASSUMPTIONS CONCERNING TRANSACTION BEHAVIOR AND THE NEED FOR MORE EXPERIMENTAL STUDIES IN THIS AREA.

KEYWORDS:
CONSISTENCY * CONCURRENCY * DATABASE MANAGEMENT *
PERFORMANCE MODELING * QUEUEING MODELS * QUEUEING NETWORKS

CATEGORIES:
3.50 * 4.33 * 8.1

REFERENCE CODE: 65

JOURNAL:
SIGIR * SIGMOD
DATE: MARCH 11 1980
PAGES: 29 - 38

TITLE:
EVALUATION OF ALTERNATIVE DATA BASE MACHINE DESIGNS

AUTHOR(s):
VEMURI, V. * LIUZZI, R. A. * CAVANO, J. P. * BERRA, P. B.

AFFILIATION:
SUNY * USAF/RADC * SYRACUSE UNIVERSITY

ABSTRACT:
THE PURPOSE OF THIS PAPER IS TO POINT OUT THE NEED FOR PERFORMANCE EVALUATION MEASURES AND TECHNIQUES SUITABLE FOR THE EVALUATION OF SPECIALIZED ARCHITECTURAL FEATURES IN NONNUMERIC APPLICATIONS. TOWARD THIS END, PROBLEMS ASSOCIATED WITH THE USE OF DATABASE MACHINES ARE EXAMINED AT THREE LEVELS OF DETAIL: THE USER LEVEL, THE SYSTEM LEVEL AND THE DEVICE LEVEL.

KEYWORDS:
DATABASE MACHINE * DATA PROCESSING ACTIVITY * DATA MODELS * ARCHITECTURAL DATA BASE MANAGEMENT * ARITHMETIC LOGIC UNITS * DATABASE PROCESSOR * ARCHITECTURAL FEATURES

CATEGORIES:
3.5 * 4.39 * 4.32 * 6.32

REFERENCE CODE: 66

JOURNAL:
SIGIR * SIGMOD
DATE: MARCH 11 1980 * MARCH 14 1980
PAGES: 49 - 56

TITLE:
HARDWARE FOR SEARCHING VERY LARGE TEXT DATABASES

AUTHOR(s):
HASKIN, R.

AFFILIATION:
UNIVERSITY OF ILLINOIS

ABSTRACT:
THIS PAPER DISCUSSES THE PROBLEM OF SEARCHING VERY LARGE TEXT DATABASES. IT IS SHOWN THAT CONVENTIONAL TECHNIQUES FOR SEARCHING CURRENT DATABASES CANNOT BE SCALED UP TO LARGER ONES, THAT IT IS NECESSARY TO BUILD HARDWARE TO SEARCH THE DATABASE IN PARALLEL IF REASONABLE SEARCH TIMES ARE EXPECTED. THE PART OF THE SEARCH PROCESS REQUIRING THE HIGHEST HARDWIDTH IS SCANNING THE DATABASE TO DETECT INSTANCES OF SEARCH TERMS. METHODS OF DOING THIS IN HARDWARE

THAT HAVE BEEN MENTIONED IN THE LITERATURE ARE EXAMINED, AND DESIGN CRITERIA FOR TERM MATCHERS ARE DISCUSSED. A NEW DESIGN THAT USES A NONDETERMINISTIC FINITE STATE AUTOMATON TO CONTROL MATCHING, IS INTRODUCED, ITS OPERATION IS EXPAINED, AND THE PRACTICALITY OF USING IT IN A REAL SYSTEM IS DISCUSSED.

KEYWORDS:
DATA BASE * SEARCHING

CATEGORIES:
3.74 * 4.33

REFERENCE CODE: 67

JOURNAL:
ACM COMPUTING SURVEYS
VOLUME: 7
ISSUE: 2
DATE: JUNE 1975
PAGES: 73 - 93

TITLE:
A STRAIGHTFORWARD MODEL FOR COMPUTER PERFORMANCE PREDICTION

AUTHOR(s):
BOYSE, JOHN W. * WARN, DAVID R.

AFFILIATION:
RESEARCH LABORATORIES, GENERAL MOTORS CORPORATION, WARREN

ABSTRACT:
BOTH SIMULATION AND ANALYTIC MODELS OF COMPUTER SYSTEMS CAN BE VERY USEFUL FOR PREDICTING THE PERFORMANCE OF PROPOSED NEW SYSTEMS OR PROPOSED CHANGES TO EXISTING SYSTEMS. UNFORTUNATELY, MANY POTENTIAL USERS OF MODELS ARE RELUCTANT TO USE THEM BECAUSE OF THE COMPLEXITY OF MANY SUCH MODELS AND THE DIFFICULTY OF RELATING THE MODEL TO THE REAL SYSTEM. THIS TUTORIAL PAPER LEADS THE READER THROUGH THE DEVELOPMENT AND USE OF AN EASILY UNDERSTOOD ANALYTIC MODEL. THIS IS THEN PLACED IN CONTEXT WITH A CLASS OF SIMILAR ANALYTIC MODELS. IN SPITE OF THE SIMPLICITY (UTILIZATION, THROUGHPUT, AND RESPONSE) USING ONLY THE MOST BASIC SYSTEM DATA AS INPUT. THESE PARAMETERS CAN EITHER BE ESTIMATES OR MEASUREMENTS FROM A RUNNING SYSTEM. THE MODEL EQUATIONS AND ASSUMPTIONS ARE DEFINED, AND A DETAILED CASE STUDY IS PRESENTED AS AN EXAMPLE OF THEIR USE.

KEYWORDS:
COMPUTER PERFORMANCE PREDICTION * ANALYTIC MODELS * QUEUEING
* SIMULATION * PERFORMANCE MEASUREMENT & EVALUATION

CATEGORIES:

4.32 * 4.6 * 6.20 * 8.1

REFERENCE CODE: 68

JOURNAL:

ACM COMPUTING SURVEYS

VOLUME: 10

ISSUE: 1

DATE: MARCH 1978

PAGES: 3 - 18

TITLE:

A REVIEW AND EVALUATION OF SOFTWARE SCIENCE

AUTHOR(s):

FITZSIMMONS, ANN * LOVE, TOM

AFFILIATION:

GENERAL ELECTRIC COMPANY

ABSTRACT:

DURING RECENT YEARS, THERE HAVE BEEN MANY ATTEMPTS TO DEFINE AND MEASURE THE "COMPLEXITY" OF A COMPUTER PROGRAM. MAURICE HALSTEAD HAS DEVELOPED A THEORY THAT GIVES OBJECTIVE MEASUREMENTS OF SOFTWARE COMPLEXITY. VARIOUS STUDIES AND EXPERIMENTS HAVE SHOWN THAT THE THEORY'S PREDICTIONS OF THE NUMBER OF BUGS IN PROGRAMS AND OF THE TIME REQUIRED TO IMPLEMENT A PROGRAM ARE AMAZINGLY ACCURATE. IT IS A PROMISING THEORY WORTHY OF MUCH MORE PROBING SCIENTIFIC INVESTIGATION. THIS PAPER REVIEWS THE THEORY, CALLED "SOFTWARE SCIENCE", AND THE EVIDENCE SUPPORTING IT. A BRIEF DESCRIPTION OF A RELATED THEORY, CALLED "SOFTWARE PHYSICS", IS INCLUDED.

KEYWORDS:

SOFTWARE RELIABILITY * SOFTWARE ENGINEERING * SOFTWARE MANAGEMENT * COGNITIVE PSYCHOLOGY * SOFTWARE MEASUREMENT * SOFTWARE COMPLEXITY

CATEGORIES:

4.0 * 4.6

REFERENCE CODE: 69

JOURNAL:

ACM COMPUTING SURVEYS

VOLUME: 10

ISSUE: 1
DATE: MARCH 1978
PAGES: 19 - 34

TITLE:
COST-BENEFIT ANALYSIS IN INFORMATION SYSTEMS DEVELOPMENT AND
OPERATION

AUTHOR(s):
KING, JOHN LESLIE * SCHREMS, EDWARD L.

AFFILIATION:
THE URBIS GROUP, PUBLIC RESEARCH ORGANIZATION, UNIVERSITY OF
CALIFORNIA, IRVINE, CALIFORNIA

ABSTRACT:
COST-BENEFIT ANALYSIS OF COMPUTER-BASED INFORMATION SYSTEMS
IS A MAJOR CONCERN OF MANAGERS IN PUBLIC AND PRIVATE
ORGANIZATIONS USING COMPUTERS. THIS PAPER INTRODUCES AND
REVIEWS BASIC ELEMENTS OF COST-BENEFIT ANALYSIS AS APPLIED
TO COMPUTERIZED INFORMATION SYSTEMS, AND PROVIDES DISCUSSION
OF THE MAJOR PROBLEMS TO BE AVOIDED.

KEYWORDS:
COST-BENEFIT ANALYSIS * MANAGEMENT OF COMPUTING * EVALUATING

CATEGORIES:
1.3 * 2.40 * 2.41 * 2.49 * 3.52 * 3.53

REFERENCE CODE: 70

JOURNAL:
ACM COMPUTING SURVEYS
VOLUME: 10
ISSUE: 3
DATE: SEPTEMBER 1978
PAGES: 263 - 280

TITLE:
A MEASUREMENT PROCEDURE FOR QUEUEING NETWORK MODELS OF
COMPUTER SYSTEMS

AUTHOR(s):
ROSE, CLIFFORD A.

AFFILIATION:
NAVAL ELECTRONIC SYSTEMS COMMAND, WASHINGTON, D.C. 20360

ABSTRACT:
THIS TUTORIAL PAPER DESCRIBES A PROCEDURE FOR OBTAINING
INPUT PARAMETER VALUES AND OUTPUT PERFORMANCE MEASURES FOR A

POPULAR CLASS OF QUEUEING NETWORK MODELS. THE PROCEDURE MAKES USE OF CURRENT MEASUREMENT MONITORS AS MUCH AS POSSIBLE. WE SURVEY THE TWO BASIC APPROACHES TO MONITORING (HARDWARE, SOFTWARE, AND HYBRID). ALSO SURVEYED ARE MEASUREMENT TOOLS FOR THE ANALYTICAL MODELING OF SEVERAL CURRENT FAMILIES OF COMPUTER SYSTEMS. WE DISCUSS IN DETAIL EXAMPLES OF MODEL VALIDATION AND PERFORMANCE PREDICTIONS TO ILLUSTRATE THE MEASUREMENT PROCEDURES AND THE CLASS OF MODELS.

KEYWORDS:

QUEUEING NETWORK MODELS * ANALYTICAL MODELS * MODEL VALIDATIONS * PERFORMANCE EVALUATION * MEASUREMENTS * MONITORS

CATEGORIES:

8.1 * 4.3

REFERENCE CODE: 71

JOURNAL:

ACM COMPUTING SURVEYS

VOLUME: 11

ISSUE: 4

DATE: DECEMBER 1979

PAGES: 371 - 395

TITLE:

DATABASE REORGANIZATION --- PRINCIPLES AND PRACTICE

AUTHOR(s):

SOCKUT, GRAY H. * GOLDBERG, ROBERT P.

AFFILIATION:

INSTITUTE FOR COMPUTER SCIENCES AND TECHNOLOGY, NATIONAL BUREAU OF STANDARDS

ABSTRACT:

DATABASE REORGANIZATION CAN BE DEFINED AS CHANGING SOME ASPECT OF THE WAY IN WHICH A DATABASE IS ARRANGED LOGICALLY AND/OR PHYSICALLY. AN EXAMPLE IS CHANGING FROM A ONE-TO-ONE TO A ONE-TO-MANY RELATIONSHIP. REORGANIZATION IS A NECESSARY FUNCTION IN A DATABASE SYSTEM. THIS PAPER INTRODUCES THE BASIC CONCEPTS OF REORGANIZATION, INCLUDING WHY IT IS PERFORMED. MANY TYPES OF REORGANIZATION ARE DESCRIBED AND CLASSIFIED INTO LOGICAL/PHYSICAL LEVELS. THEN PRAGMATIC ISSUES SUCH AS REORGANIZATION STRATEGIES, A SURVEY OF SEVERAL COMMERCIAL REORGANIZATION FACILITIES, CASE STUDIES, AND DATABASE ADMINISTRATION CONSIDERATIONS ARE COVERED. FINALLY, SEVERAL RESEARCH EFFORTS ARE SURVEYED.

KEYWORDS:

DATABASE * DATABASE MANAGEMENT * REORGANIZATION *
RESTRUCTURING * FILE MAINTENANCE

CATEGORIES:

2.43 * 3.51 * 3.73 * 4.33 * 4.34

REFERENCE CODE: 72

JOURNAL:

ACM COMPUTING SURVEYS

VOLUME: 14

ISSUE: 2

DATE: JUNE 1982

PAGES: 245 - 286

TITLE:

THE INTEGRATED DICTIONARY/DIRECTORY SYSTEM

AUTHOR(s):

ALLEN, FRANK W. * LOOMIS, MARY E. S. * MANNINO, MICHAEL V.

AFFILIATION:

DEPARTMENT OF MANAGEMENT INFORMATION SYSTEMS, UNIVERSITY OF
ARIZONA,

ABSTRACT:

THE CONCEPT OF AN INTEGRATED DICTIONARY/DIRECTORY (D/D) SYSTEM IS DISCUSSED IN DETAIL, AND THE STATE OF CURRENT SYSTEMS IN BOTH THE CENTRALIZED AND DISTRIBUTED DATABASE ENVIRONMENTS IS SURVEYED. FOR THE CENTRALIZED DATABASE ENVIRONMENT, THREE ASPECTS ARE EMPHASIZED: (1) THE SOFTWARE INTERFACES BETWEEN THE D/D SYSTEM AND OTHER SOFTWARE PACKAGES, (2) THE CONVERT FUNCTION OF THE D/D SYSTEM, AND (3) THE ENVIRONMENTAL DEPENDENCY BETWEEN THE D/D SYSTEM AND A DATABASE MANAGEMENT SYSTEM (DBMS). FOR THE DISTRIBUTED DATABASE ENVIRONMENT, THE ARTICLE ELUCIDATES THE NECESSARY EXTENSIONS TO THE CENTRALIZED D/D, THE ADDITIONAL SOFTWARE INTERFACES REQUIRED, AND THE USE OF THE D/D AS A DISTRIBUTED DATABASE. AN EXAMPLE OF A COMMERCIAL D/D SYSTEM THAT IS INTEGRATED WITH A DISTRIBUTED DBMS IS PRESENTED.

KEYWORDS:

DOCUMENTATION * LANGUAGES * MANAGEMENT

CATEGORIES:

3.42 * 3.5

REFERENCE CODE: 73

JOURNAL:
ACM COMPUTING SURVEYS
VOLUME: 14
ISSUE: 2
DATE: JUNE 1982
PAGES: 287 - 313

TITLE:
COMPARATIVE MODELS OF THE FILE ASSIGNMENT PROBLEM

AUTHOR(s):
DOWDY, LAWRENCE W. * FOSTER, DERRELL V.

AFFILIATION:
DEPARTMENT OF COMPUTER SCIENCE, VANDERBILT UNIVERSITY,
NASHVILLE, TENNESSEE

ABSTRACT:
THE OPTIMAL DISTRIBUTION OF FILES AMONG STORAGE NODES IS A MAJOR PROBLEM IN COMPUTER SYSTEM OPTIMIZATION. DIFFERING DESIGN GOALS, VARYING SYSTEM ASSUMPTIONS, AND CONTRASTING SOLUTION TECHNIQUES YIELD A DISPARITY OF OPTIMAL FILE ASSIGNMENTS. THIS PAPER VIEWS THE DIFFERING FILE ASSIGNMENT MODELS IN A UNIFORM MANNER. RELATIVE ADVANTAGES AND WEAKNESSES OF THE VARIOUS MODELS BECOME IMMEDIATELY APPARENT. THIS PERSPECTIVE EXPOSES THE FURTHER RESEARCH WHICH IS NECESSARY IN ORDER TO PROVIDE A TRULY SATISFACTORY SOLUTION TO THE FILE ASSIGNMENT PROBLEM.

KEYWORDS:
ALGORITHMS * DESIGN * PERFORMANCE * FILE ASSIGNMENT *
COMPUTER NETWORKS * QUEUEING NETWORK MODELS

CATEGORIES:
3.73 * 4.20 * 7.20

REFERENCE CODE: 74

JOURNAL:
ACM COMPUTING SURVEYS
VOLUME: 15
ISSUE: 1
DATE: MARCH 1983
PAGES: 45 - 79

TITLE:
TECHNIQUES FOR STRUCTURING DATABASE RECORDS MINNESOTA

AUTHOR(s):
MARCH, SALVATORE T.

AFFILIATION:
DEPARTMENT OF MANAGEMENT SCIENCE, SCHOOL OF MANAGEMENT

ABSTRACT:
STRUCTURING DATABASE RECORDS BY CONSIDERING DATA ITEM USAGE CAN YIELD SUBSTANTIAL EFFICIENCIES IN THE OPERATING COST OF DATABASE SYSTEMS. HOWEVER, SINCE THE NUMBER OF POSSIBLE PHYSICAL RECORD STRUCTURES FOR DATABASE OF PRACTICAL SIGNIFICANCE IS ENORMOUS, AND THEIR EVALUATION IS EXTREMELY COMPLEX DETERMINING EFFICIENT RECORD STRUCTURES BY FULL ENUMERATION IS GENERALLY INFEASIBLE. THIS PAPER DISCUSSES THE TECHNIQUES OF MATHEMATICAL CLUSTERING, ITERATIVE GROUPING REFINEMENT, MATHEMATICAL PROGRAMMING, AND, HIERARCHIC AGGREGATION, WHICH CAN BE USED TO QUICKLY DETERMINE EFFICIENT RECORD STRUCTURES FOR LARGE, SHARED DATABASES.

KEYWORDS:
ECONOMICS * PERFORMANCE * AGGREGATION * RECORD SEGMENTATION
* RECORD STRUCTURES

CATEGORIES:
3.31 * 4.33 * 4.34

REFERENCE CODE: 75

JOURNAL:
TODS
VOLUME: 1
ISSUE: 1
DATE: MARCH 1976
PAGES: 66 - 94

TITLE:
OPTIMAL ALLOCATION OF RESOURCES IN DISTRIBUTED INFORMATION NETWORKS

AUTHOR(s):
MAHMOUD, SAMY * RIORDON, J. S.

AFFILIATION:
CARLETON UNIVERSITY, CANADA

ABSTRACT:
THE PROBLEMS OF FILE ALLOCATION AND CAPACITY ASSIGNMENT IN A FIXED TOPOLOGY DISTRIBUTED COMPUTER NETWORK ARE EXAMINED. THESE TWO ASPECTS OF THE DESIGN ARE TIGHTLY COUPLED BY MEANS OF AN AVERAGE MESSAGE DELAY CONSTRAINT. THE OBJECTIVE IS TO ALLOCATE COPIES OF INFORMATION FILES TO NETWORK NODES AND CAPACITIES TO NETWORK LINKS SO THAT A MINIMUM COST IS

ACHIEVED SUBJECT TO NETWORK DELAY AND FILE AVAILABILITY CONSTRAINTS. A MODEL FOR SOLVING THE PROBLEM IS FORMULATED AND THE RESULTING OPTIMIZATION PROBLEM IS SHOWN TO FALL INTO A CLASS OF NONLINEAR INTEGER PROGRAMMING PROBLEMS. DETERMINISTIC TECHNIQUES FOR SOLVING THIS CLASS OF PROBLEMS ARE COMPUTATIONALLY CUMBERSOME, EVEN FOR SMALL SIZE PROBLEMS. A NEW HEURISTIC ALGORITHM IS DEVELOPED, WHICH IS BASED ON A DECOMPOSITION TECHNIQUE THAT GREATLY REDUCES THE COMPUTATIONAL COMPLEXITY OF THE PROBLEM. NUMERICAL RESULTS FOR A VARIETY OF NETWORK CONFIGURATIONS INDICATE THAT THE HEURISTIC ALGORITHM, WHILE NOT THEORETICALLY CONVERGENT, YIELDS PRACTICABLE LOW COST SOLUTIONS WITH SUBSTANTIAL SAVINGS IN COMPUTER PROCESSING TIME AND STORAGE REQUIREMENTS. MOREOVER, IT IS SHOWN THAT THIS ALGORITHM IS CAPABLE OF SOLVING REALISTIC NETWORK PROBLEMS WHOSE SOLUTIONS USING DETERMINISTIC TECHNIQUES ARE COMPUTATIONALLY INTRACTABLE.

KEYWORDS:

INFORMATION NETWORKS * DATA FILES * LINK CAPACITIES *
RESOURCE SHARING * DISTRIBUTED COMPUTING.

CATEGORIES:

3.81

REFERENCE CODE: 76

JOURNAL:

TODS

VOLUME: 1

ISSUE: 4

DATE: DECEMBER 1976

PAGES: 317 - 343

TITLE:

PERFORMANCE OF A DATABASE MANAGER IN A VIRTUAL MEMORY SYSTEM

AUTHOR(s):

SHERMAN, STEPHEN W. * BRICE, RICHARD S.

AFFILIATION:

NASA LANGLEY RESEARCH CENTER * GEORGE WASHINGTON UNIVERSITY

ABSTRACT:

BUFFER SPACE IS CREATED AND MANAGED IN DATABASE SYSTEMS IN ORDER TO REDUCE ACCESSSES TO THE I/O DEVICES FOR DATABASE INFORMATION. IN SYSTEMS USING VIRTUAL MEMORY ANY INCREASE IN THE BUFFER SPACE MAY BE ACCOMPANIED BY AN INCREASE IN PAGING. THE EFFECTS OF THESE FACTORS ON SYSTEM PERFORMANCE ARE QUANTIFIED WHERE SYSTEM PERFORMANCE IS A FUNCTION OF PAGE FAULTS AND DATABASE ACCESSSES TO I/O DEVICES. THIS

PHENOMENON IS EXAMINED THROUGH THE ANALYSIS OF EMPIRICAL DATA GATHERED IN A MULTIFACTOR EXPERIMENT. THE FACTORS CONSIDERED ARE MEMORY SIZE, SIZE OF BUFFER SPACE, MEMORY REPLACEMENT ALGORITHM. THE IMPROVEMENT OF SYSTEM PERFORMANCE THROUGH AN INCREASE IN THE SIZE OF THE BUFFER SPACE IS DEMONSTRATED. IT IS ALSO SHOWN THAT FOR CERTAIN VALUES OF THE OTHER FACTORS AN INCREASE IN THE SIZE OF THE BUFFER SPACE CAN CAUSE PERFORMANCE TO DETERIORATE.

KEYWORDS:

PERFORMANCE * DATABASE MANAGEMENT * VIRTUAL MEMORY * DOUBLE PAGING * VIRTUAL BUFFER * PAGE FAULTS * PAGE REPLACEMENT ALGORITHM * BUFFER MANAGER.

CATEGORIES:

3.72 * 4.3 * 4.33 * 4.35 * 4.6

REFERENCE CODE: 77

JOURNAL:

TODS

VOLUME: 1

ISSUE: 4

DATE: DECEMBER 1976

PAGES: 370 - 387

TITLE:

ON USER CRITERIA FOR DATA MODEL EVALUATION

AUTHOR(s):

McGEE, WILLIAM C.

AFFILIATION:

IBM CORPORATION

ABSTRACT:

THE EMERGENCE OF A DATABASE TECHNOLOGY IN RECENT YEARS HAS FOCUSED INTEREST ON THE SUBJECT OF DATA MODELS. A DATA MODEL IS THE CLASS OF LOGICAL DATA STRUCTURES WHICH A COMPUTER SYSTEM OR LANGUAGE MAKES AVAILABLE TO THE USER FOR THE PURPOSE OF FORMULATING DATA PROCESSING APPLICATIONS. THE DIVERSITY OF COMPUTER SYSTEMS AND LANGUAGES HAS RESULTED IN A CORRESPONDING DIVERSITY OF DATA MODELS, AND HAS CREATED A PROBLEM FOR THE USER IN SELECTING A DATA MODEL WHICH IS IN SOME SENSE APPROPRIATE TO A GIVEN APPLICATION. AN EVALUATION PROCEDURE IS NEEDED WHICH WILL ALLOW THE USER TO EVALUATE ALTERNATIVE MODELS IN THE CONTEXT OF A SPECIFIC SET OF APPLICATIONS. THIS PAPER TAKES A FIRST STEP TOWARD SUCH A PROCEDURE BY IDENTIFYING THE ATTRIBUTES OF A DATA MODEL WHICH CAN BE USED AS CRITERIA FOR EVALUATION THE MODEL. TWO KINDS OF CRITERIA ARE PRESENTED: USE CRITERIA, WHICH MEASURE

THE USABILITY OF THE MODEL; AND IMPLEMENTATION CRITERIA, WHICH MEASURE THE IMPLEMENTABILITY OF THE MODEL AND THE EFFICIENCY OF THE RESULTING IMPLEMENTATION. THE USE OF THE CRITERIA IS ILLUSTRATED BY APPLYING THEM TO THREE SPECIFIC MODELS: AN N-ARY RELATIONAL MODEL, A HIERARCHIC MODEL, AND A NETWORK MODEL.

KEYWORDS:

DATA MODEL * DATA MODEL EVALUATION * DATA MODEL SELECTION *
RELATIONAL MODEL * HIERARCHIC MODEL * NETWORK MODEL

CATEGORIES:

4.20 * 4.33 * 4.34

REFERENCE CODE: 78

JOURNAL:

TODS

VOLUME: 2

ISSUE: 1

DATE: MARCH 1977

PAGES: 45 - 67

TITLE:

AN ATTRIBUTE BASED MODEL FOR DATABASE ACCESS COST ANALYSIS

AUTHOR(s):

YAO, S. B.

AFFILIATION:

PURDUE UNIVERSITY

ABSTRACT:

A GENERALIZED MODEL FOR PHYSICAL DATABASE ORGANIZATIONS IS PRESENTED. EXISTING DATABASE ORGANIZATIONS ARE SHOWN TO FIT EASILY INTO THE MODEL AS SPECIAL CASES. GENERALIZED ACCESS ALGORITHMS AND COST EQUATIONS ASSOCIATED WITH THE MODEL ARE DEVELOPED AND ANALYZED. THE MODEL PROVIDES A GENERAL DESIGN FRAMEWORK IN WHICH THE DISTINGUISHING PROPERTIES OF DATABASE ORGANIZATIONS ARE MADE EXPLICIT AND THEIR PERFORMANCES CAN BE COMPARED.

KEYWORDS:

DATABASE ORGANIZATION * INDEX ORGANIZATION * DATABASE
PERFORMANCE EVALUATION * DATABASE MODEL * INVERTED FILE *
MULTILIST * INDEX SEQUENTIAL * B-TREE

CATEGORIES:

3.70 * 3.72 * 3.73 * 3.74 * 4.33

REFERENCE CODE: 79

JOURNAL:

TODS

VOLUME: 2

ISSUE: 1

DATE: MARCH 1977

PAGES: 68 - 90

TITLE:

MINIMUM COST SELECTION OF SECONDARY INDEXES FOR FORMATTED FILES

AUTHOR(s):

ANDERSON, HENRY D. * BERRA, P. BRUCE

AFFILIATION:

SYRACUSE UNIVERSITY

ABSTRACT:

SECONDARY INDEXES ARE OFTEN USED IN DATABASE MANAGEMENT SYSTEMS FOR SECONDARY KEY RETRIEVAL. ALTHOUGH THEIR USE CAN IMPROVE RETRIEVAL TIME SIGNIFICANTLY, THE COST OF INDEX MAINTENANCE AND STORAGE INCREASES THE OVERHEAD OF THE FILE PROCESSING APPLICATION. THE OPTIMAL SET OF INDEXED SECONDARY KEYS FOR A PARTICULAR APPLICATION DEPENDS ON A NUMBER OF APPLICATION DEPENDENT FACTORS. IN THIS PAPER A COST FUNCTION IS DEVELOPED FOR THE EVALUATION OF CANDIDATE INDEXING CHOICES AND APPLIED TO THE OPTIMIZATION OF INDEX SELECTION. FACTORS ACCOUNTED FOR INCLUDE FILE SIZE, THE RELATIVE RATES OF RETRIEVAL AND MAINTENANCE OVER THE CANDIDATE KEYS, INDEX STRUCTURE, AND SYSTEM CHARGING RATES. AMONG THE RESULT DEMONSTRATED ARE THE INCREASED EFFECTIVENESS OF SECONDARY INDEXES FOR LARGE FILE, THE EFFECT OF THE RELATIVE RATES OF RELATIVE RATES OF RETRIEVAL AND MAINTENANCE THE GREATER COST OF ALLOWING FOR ARBITRARILY FORMULATED QUERIES, AND THE IMPACT ON COST OF THE USE OF DIFFERENT INDEX STRUCTURES.

KEYWORDS:

SECONDARY INDEX * SECONDARY KEY * INVERTED INDEX * INVERTED FILE * SECONDARY KEY ACCESS * DATABASE * DATA MANAGEMENT * FILE DESIGN * RETRIEVAL * OPTIMIZATION * ACCESS METHODS * ACCESS PATH * BOOLEAN QUERY * COST FUNCTION

CATEGORIES:

3.50 * 3.72 * 3.74 * 4.33 * 4.34

REFERENCE CODE: 80

JOURNAL:

TODS
VOLUME: 2
ISSUE: 2
DATE: JUNE 1977
PAGES: 175 - 195

TITLE:
PERFORMANCE EVALUATION OF A RELATIONAL ASSOCIATIVE PROCESSOR

AUTHOR(s):
OZKARAHAN, E. A. * SCHUSTER, S. A. * SEVCIK, K. C.

AFFILIATION:
UNIVERSITY OF TORONTO, CANADA

ABSTRACT:
AN ASSOCIATIVE PROCESSOR CALLED RAP HAS BEEN DESIGNED TO PROVIDE HARDWARE SUPPORT FOR THE USE AND MANIPULATION OF DATABASES. RAP IS PARTICULARLY SUITED FOR SUPPORTING RELATIONAL DATABASES. IN THIS PAPER, THE RELATIONAL OPERATIONS PROVIDED BY THE RAP HARDWARE ARE DESCRIBED, AND A REPRESENTATIVE APPROACH TO PROVIDING THE SAME RELATIONAL OPERATIONS WITH CONVENTIONAL SOFTWARE AND HARDWARE IS DEvised. ANALYTIC MODELS ARE CONSTRUCTED FOR RAP AND THE CONVENTIONAL SYSTEM. THE EXECUTION TIMES OF SEVERAL OF THE OPERATIONS ARE SHOWN TO BE VASTLY IMPROVED WITH RAP FOR LARGE RELATIONS.

KEYWORDS:
DATABASE MACHINES * ASSOCIATIVE PROCESSORS * PERFORMANCE EVALUATION * RELATIONAL DATABASES

CATEGORIES:
3.7 * 4.33 * 4.6 * 6.22 * 8.1

REFERENCE CODE: 81

JOURNAL:
TODS
VOLUME: 2
ISSUE: 2
DATE: JUNE 1977
PAGES: 196 - 207

TITLE:
AN EXTENSION OF THE PERFORMANCE OF A DATABASE MANAGER IN A VIRTUAL MEMORY SYSTEM USING PARTIALLY LOCKED VIRTUAL BUFFERS

AUTHOR(s):
BRICE, RICHARD S. * SHERMAN, STEPHEN W.

AFFILIATION:

THE GEORGE WASHINGTON UNIVERSITY * UNIVERSITY OF NEVADA, LAS VEGAS

ABSTRACT:

BUFFER POOLS ARE CREATED AND MANAGED IN DATABASE SYSTEMS IN ORDER TO REDUCE THE TOTAL NUMBER OF ACCESSSES TO THE I/O DEVICES. IN SYSTEMS USING VIRTUAL MEMORY, ANY REDUCTION IN I/O ACCESSSES MAY BE ACCOMPANIED BY AN INCREASE IN PAGING. THE EFFECTS OF THESE FACTORS ON SYSTEM PERFORMANCE ARE QUANTIFIED, WHERE SYSTEM PERFORMANCE IS A FUNCTION OF PAGE FAULTS AND DATABASE ACCESSSES TO THE I/O DEVICES. A PREVIOUS STUDY OF THIS PHENOMENON IS EXTENDED THROUGH THE ANALYSIS OF EMPIRICAL DATA GATHERED IN A MULTIFACTOR EXPERIMENT. IN THIS STUDY MEMORY IS PARTITIONED BETWEEN THE PROGRAM AND THE BUFFER SO THAT THE IMPACT OF THE CONTROLLED FACTORS CAN BE MORE EFFECTIVELY EVALUATED. IT IS POSSIBLE TO IMPROVE SYSTEM PERFORMANCE THROUGH THE USE OF DIFFERENT PAGING ALGORITHMS IN THE PROGRAM PARTITION AND THE BUFFER PARTITION. ALSO, THE EFFECTS ON SYSTEM PERFORMANCE AS THE VIRTUAL BUFFER SIZE IS INCREASED BEYOND THE REAL MEMORY ALLOCATED TO THE BUFFER PARTITION ARE INVESTIGATED.

KEYWORDS:

DATABASE MANAGEMENT * VIRTUAL MEMORY * DOUBLE PAGING * VIRTUAL BUFFER * PAGING FAULTS * PAGE REPLACEMENT ALGORITHM * BUFFER MANAGER * LOCKED BUFFER

CATEGORIES:

3.72 * 4.3 * 4.33 * 4.35 * 4.6

REFERENCE CODE: 82

JOURNAL:

TODS

VOLUME: 3

ISSUE: 1

DATE: MARCH 1978

PAGES: 1 - 31

TITLE:

SEARCH STRATEGY AND SELECTION FUNCTION FOR AN INFERENTIAL RELATIONAL SYSTEM

AUTHOR(s):

MINKER, JACK

AFFILIATION:

UNIVERSITY OF MARYLAND

ABSTRACT:

AN INFERENTIAL RELATIONAL SYSTEM IS ONE IN WHICH DATA IN THE SYSTEM CONSISTS OF BOTH EXPLICIT FACTS AND GENERAL AXIOMS (OR "VIEWS"). THE GENERAL AXIOMS ARE USED TOGETHER WITH THE EXPLICIT FACTS TO DERIVE THE FACTS THAT ARE IMPLICIT (VIRTUAL RELATIONS) WITHIN THE SYSTEM. A TOP-DOWN ALGORITHM, AS USED IN ARTIFICIAL INTELLIGENCE WORK, IS DESCRIBED TO DEVELOP INFERENCES WITHIN THE SYSTEM. THE TOP-DOWN APPROACH STARTS WITH THE QUERY, A CONJUNCTION OF RELATIONS, TO BE ANSWERED. EITHER A RELATIONAL FACT SOLVES A GIVEN RELATION IN A CONJUNCT, OR THE RELATION IS REPLACED BY A CONJUNCT OF RELATIONS WHICH MUST BE SOLVED TO SOLVE THE GIVEN RELATION. THE APPROACH REQUIRES THAT ONE AND ONLY ONE RELATION IN A CONJUNCTION BE REPLACED (OR EXPANDED) BY THE GIVEN FACTS AND GENERAL AXIOMS. THE DECISION TO EXPAND ONLY A SINGLE RELATION IS TERMED A SELECTION FUNCTION. IT IS SHOWN FOR RELATIONAL SYSTEMS THAT SUCH A RESTRICTION STILL GUARANTEES THAT A SOLUTION TO THE PROBLEM WILL BE FOUND IF ONE EXISTS. THE ALGORITHM PROVIDES FOR HEURISTIC DIRECTION IN THE SEARCH PROCESS. EXPERIMENTAL RESULTS ARE PRESENTED WHICH ILLUSTRATE THE TECHNIQUES. A BOOKKEEPING MECHANISM IS DESCRIBED WHICH PERMITS ONE TO KNOW WHEN SUBPROBLEMS ARE SOLVED. IT FURTHER FACILITATES THE OUTPUTING OF REASONS FOR THE DEDUCTIVELY FOUND ANSWER IN A COHERENT FASHION.

KEYWORDS:

ANSWER AND REASON EXTRACTION * HEURISTICS * INFERENCE
MECHANISM * LOGIC PREDICATE CALCULUS * RELATIONAL DATABASES
* SEARCH STRATEGY * SELECTION FUNCTION * TOP-DOWN SEARCH *
VIRTUAL RELATIONS

CATEGORIES:

3.60 * 4.33

REFERENCE CODE: 83

JOURNAL:

TODS

VOLUME: 3

ISSUE: 1

DATE: MARCH 1978

PAGES: 32 - 40

TITLE:

OPTIMUM REORGANIZATION POINTS FOR LINEARLY GROWING FILES

AUTHOR(s):

TUEL, WILLIAM G. JR.

AFFILIATION:

IBM CORPORATION

ABSTRACT:

THE PROBLEM OF FINDING OPTIMAL REORGANIZATION INTERVALS FOR LINEARLY GROWING FILES IS SOLVED. AN APPROXIMATE REORGANIZATION POLICY, INDEPENDENT OF FILE LIFETIME, IS OBTAINED. BOTH THE OPTIMUM AND APPROXIMATE POLICIES ARE COMPARED TO PREVIOUSLY PUBLISHED RESULTS USING A NUMERICAL EXAMPLE.

KEYWORDS:

DATABASE * FILE ORGANIZATION * REORGANIZATION * OPTIMIZATION

CATEGORIES:

2.43 * 3.73 * 4.33

REFERENCE CODE: 84

JOURNAL:

TODS

VOLUME: 3

ISSUE: 1

DATE: MARCH 1978

PAGES: 57 - 91

TITLE:

CASDAL: CASSM'S DATA LANGUAGE

AUTHOR(s):

SU, STANLEY Y. W. * EMAN, AHMED

AFFILIATION:

UNIVERSITY OF FLORIDA, GAINESVILLE, FLORIDA

ABSTRACT:

CASDAL IS A HIGH LEVEL DATA LANGUAGE DESIGNED AND IMPLEMENTED FOR THE DATABASE MACHINE CASSM. THE LANGUAGE IS USED FOR THE MANIPULATION AND MAINTENANCE OF A DATABASE USING AN UNNORMALIZED (HIERARCHICALLY STRUCTURED) RELATIONAL DATA MODEL. IT ALSO HAS FACILITIES TO DEFINE, MODIFY, AND MAINTAIN THE DATA MODEL DEFINITION. THE UNIQUENESS OF CASDAL LIES IN ITS POWER TO SPECIFY COMPLEX OPERATIONS IN TERMS OF SEVERAL NEW LANGUAGE CONSTRUCTS AND ITS CONCEPT OF TAGGING OR MARKING TUPLES AND OF MATCHING VALUES WHEN WALKING FROM RELATION TO RELATION. THE LANGUAGE IS A RESULT OF A TOP-DOWN DESIGN AND DEVELOPMENT EFFORT FOR A DATABASE MACHINE IN WHICH HIGH LEVEL LANGUAGE CONSTRUCTS ARE DIRECTLY SUPPORTED BY THE HARDWARE. THIS PAPER (1) GIVES JUSTIFICATIONS FOR THE USE OF AN UNNORMALIZED RELATIONAL MODEL ON WHICH THE LANGUAGE IS BASED, (2) PRESENTS THE CASDAL LANGUAGE CONSTRUCTS WITH EXAMPLES, AND (3) DESCRIBES CASSM'S ARCHITECTURE AND FACILITATE THE TRANSLATION PROCESS. THIS PAPER ALSO ATTEMPTS TO SHOW HOW THE EFFICIENCY OF THE

LANGUAGE AND THE TRANSLATION TASK CAN BE ACHIEVED AND SIMPLIFIED IN A SYSTEM IN WHICH THE LANGUAGE IS THE RESULT OF A TOP-DOWN SYSTEM DESIGN AND DEVELOPMENT.

KEYWORDS:

QUERY LANGUAGE * RELATIONAL MODEL * ASSOCIATIVE MEMORY * DATABASE' NONPROCEDURAL LANGUAGE

CATEGORIES:

3.74 * 3.75 * 4.22 * 4.33 * 4.34 * 5.31

REFERENCE CODE: 85

JOURNAL:

TODS

VOLUME: 3

ISSUE: 4

DATE: DECEMBER 1978

PAGES: 417 - 439

TITLE:

IMPROVING THE HUMAN FACTORS ASPECT OF DATABASE INTERACTIONS

AUTHOR(s):

SHNEIDERMAN, BEN

AFFILIATION:

UNIVERSITY OF MARYLAND

ABSTRACT:

THE WIDESPREAD DISSEMINATION OF COMPUTER AND INFORMATION SYSTEMS TO NONTECHNICALLY TRAINED INDIVIDUALS REQUIRES A NEW APPROACH TO THE DESIGN AND DEVELOPMENT OF DATABASE INTERFACES. THIS PAPER PROVIDES THE MOTIVATIONAL BACKGROUND FOR CONTROLLED PSYCHOLOGICAL EXPERIMENTATION IN EXPLORING THE PERSON/MACHINE INTERFACE. FRAMEWORKS FOR THE REDUCTIONIST APPROACH ARE GIVEN, RESEARCH METHODS DISCUSSED, RESEARCH ISSUES PRESENTED, AND A SMALL EXPERIMENT IS OFFERED AS AN EXAMPLE OF WHAT CAN BE ACCOMPLISHED. THIS EXPERIMENT IS A COMPARISON OF NATURAL AND ARTIFICIAL LANGUAGE QUERY FACILITIES. ALTHOUGH SUBJECTS POSED APPROXIMATELY EQUAL NUMBERS OF VALID QUERIES WITH EITHER FACILITY, NATURAL LANGUAGE USERS MADE SIGNIFICANTLY MORE INVALID QUERIES WHICH COULD NOT BE ANSWERED FROM THE DATABASE THAT WAS DESCRIBED.

KEYWORDS:

HUMAN FACTORS * DATABASE SYSTEMS * DATA MODELS * QUERY LANGUAGES * NATURAL LANGUAGE INTERFACES * PSYCHOLOGY * EXPERIMENTATION

CATEGORIES:

4.33 * 4.6 * 3.72

REFERENCE CODE: 86

JOURNAL:

TODS

VOLUME: 3

ISSUE: 4

DATE: DECEMBER 1978

PAGES: 440 - 445

TITLE:

THE DIFFICULTY OF OPTIMUM INDEX SELECTION

AUTHOR(s):

COMER, DOUGLAS

AFFILIATION:

PURDUE UNIVERSITY

ABSTRACT:

GIVEN A FILE ON A SECONDARY STORE IN WHICH EACH RECORD HAS SEVERAL ATTRIBUTES, IT IS USUALLY ADVANTAGEOUS TO BUILD AN INDEX MECHANISM TO DECREASE THE COST OF CONDUCTING TRANSACTIONS TO THE FILE. THE PROBLEM OF SELECTING ATTRIBUTES OVER WHICH TO INDEX HAS BEEN STUDIED IN THE CONTEXT OF VARIOUS STORAGE STRUCTURES AND ACCESS ASSUMPTIONS. ONE ALGORITHM TO MAKE AN OPTIMUM INDEX SELECTION REQUIRES 2^*K STEPS IN THE WORST CASE, WHERE K IS THE NUMBER OF ATTRIBUTES IN THE FILE. WE EXAMINE THE QUESTION OF WHETHER A MORE EFFICIENT ALGORITHM MIGHT EXIST AND SHOW THAT EVEN UNDER A SIMPLE COST CRITERION THE PROBLEM IS COMPUTATIONALLY DIFFICULT IN A PRECISE SENSE. OUR RESULTS EXTEND DIRECTLY TO OTHER RELATED PROBLEMS WHERE THE COST OF INDEX DEPENDS ON FIXED VALUES WHICH ARE ASSIGNED TO EACH ATTRIBUTE. SOME PRACTICAL IMPLICATIONS ARE DISCUSSED.

KEYWORDS:

ATTRIBUTE SELECTION * SECONDARY INDEX * INDEX SELECTION * COMPLEXITY

CATEGORIES:

3.73 * 3.74 * 4.33 * 4.34

REFERENCE CODE: 87

JOURNAL:

TODS

VOLUME: 4

ISSUE: 2
DATE: JUNE 1979
PAGES: 133 - 155

TITLE:
OPTIMIZATION OF QUERY EVALUATION ALGORITHMS

AUTHOR(s):
YAO, S. BING

AFFILIATION:
PURDUE UNIVERSITY

ABSTRACT:
A MODEL OF DATABASE STORAGE AND ACCESS IS PRESENTED. THE MODEL REPRESENTS MANY EVALUATION ALGORITHMS AS SPECIAL CASES, AND HELPS TO BREAK A COMPLEX ALGORITHM INTO SIMPLE ACCESS OPERATIONS. GENERALIZED ACCESS COST EQUATIONS ASSOCIATED WITH THE MODEL ARE DEVELOPED AND ANALYZED. OPTIMIZATION OF THESE COST EQUATIONS YIELDS AN OPTIMAL ACCESS ALGORITHM WHICH CAN BE SYNTHESIZED BY A QUERY SYSTEM WHOSE DESIGN IS BASED ON THE MODULAR ACCESS OPERATIONS.

KEYWORDS:
RELATIONAL DATA MODEL * QUERY LANGUAGE * DATA MANIPULATION LANGUAGE * QUERY OPTIMIZATION * DATABASE OPTIMIZATION * INVERTED FILE

CATEGORIES:
3.70 * 3.72 * 3.74 * 4.33

REFERENCE CODE: 88

JOURNAL:
TODS
VOLUME: 4
ISSUE: 2
DATE: JUNE 1979
PAGES: 228 - 239

TITLE:
PARTIAL-MATCH HASH CODING: BENEFITS OF REDUNDANCY

AUTHOR(s):
BURKHARD, WALTER A.

AFFILIATION:
UNIVERSITY OF CALIFORNIA AT SAN DIEGO

ABSTRACT:
FILE DESIGNS SUITABLE FOR RETRIEVAL FROM A FILE OF K-FIELD

RECORDS WHEN QUERIES MAY BE PARTIALLY SPECIFIED ARE EXAMINED. STORAGE REDUNDANCY IS INTRODUCED TO OBTAIN IMPROVED WORST-CASE AND AVERAGE-CASE PERFORMANCES. THE RESULTING STORAGE SCHEMES ARE APPROPRIATE FOR REPLICATED DISTRIBUTED DATABASE ENVIRONMENTS; IT IS POSSIBLE TO IMPROVE THE OVERALL AVERAGE AND WORST-CASE BEHAVIOR FOR QUERY RESPONSE AS WELL AS PROVIDE AN ENVIRONMENT WITH VERY HIGH RELIABILITY. WITHIN PRACTICAL SYSTEMS IT WILL BE POSSIBLE TO IMPROVE THE QUERY RESPONSE TIME PERFORMANCE AS WELL RELIABILITY OVER COMPARABLE SYSTEMS WITHOUT REPLICATION.

KEYWORDS:

ALGORITHMS * ANALYSIS * SEARCHING * DATA STRUCTURES *
DATABASE SYSTEMS * REPLICATION * ACCESS METHODS

CATEGORIES:

3.72 * 3.74 * 4.33 * 5.0 * 5.25

REFERENCE CODE: 89

JOURNAL:

TODS

VOLUME: 5

ISSUE: 1

DATE: MARCH 1980

PAGES: 69 - 87

TITLE:

PERFORMANCE EVALUATION OF ATTRIBUTE-BASED TREE ORGANIZATION

AUTHOR(s):

GOPALAKRISHNA, V. * MADHAVAN, C. E. VENI

AFFILIATION:

NATIONAL INFORMATION CENTRE, INDIA

ABSTRACT:

A MODIFIED VERSION OF THE MULTIPLE ATTRIBUTE TREE (MAT) DATABASE ORGANIZATION, WHICH USES A COMPACT DIRECTORY, IS DISCUSSED. AN EFFICIENT ALGORITHM TO PROCESS THE DIRECTORY FOR CARRYING OUT THE NODE SEARCHES IS PRESENTED. STATISTICAL PROCEDURES ARE DEVELOPED TO ESTIMATE THE NUMBER OF NODES SEARCHED AND THE NUMBER OF DATA BLOCKS RETRIEVED FOR MOST GENERAL AND COMPLEX QUERIES. THE PERFORMANCE OF INVERTED FILE AND MODIFIED MAT ORGANIZATIONS ARE COMPARED USING SIX REAL-LIFE DATABASES AND FOUR TYPES OF QUERY COMPLEXITIES. CAREFUL TRADEOFFS ARE ESTABLISHED IN TERMS OF STORAGE AND ACCESS TIMES FOR DIRECTORY AND DATA, QUERY COMPLEXITIES, AND DATABASE CHARACTERISTICS.

KEYWORDS:

AVERAGE RETRIEVAL TIME PER QUERY * DATABASE ORGANIZATION *
DATABASE PERFORMANCE * DIRECTORY SEARCH TIME * MODIFIED
MULTIPLE ATTRIBUTE TREE * SECONDARY INDEX ORGANIZATION *
QUERY COMPLEXITY * ACCESS TIME

CATEGORIES:

3.70 * 3.72 * 3.73 * 3.74 * 4.33

REFERENCE CODE: 90

JOURNAL:

TODS

VOLUME: 6

ISSUE: 4

DATE: DECEMBER 1981

PAGES: 626 - 649

TITLE:

HUMAN FACTORS COMPARISON OF A PROCEDURAL AND A NONPROCEDURAL
QUERY LANGUAGE

AUTHOR(s):

WELTY, CHARLS * STEMPLE, DAVID W.

AFFILIATION:

UNIVERSITY OF SOUTHERN MAINE * UNIVERSITY OF MASSACHUSETTS

ABSTRACT:

TWO EXPERIMENTS TESTING THE ABILITY OF SUBJECTS TO WRITE
QUERIES IN TWO DIFFERENT QUERY LANGUAGES WERE RUN. THE TWO
LANGUAGES, AQL AND TABLET, DIFFER PRIMARILY IN THEIR
PROCEDURALITY; BOTH LANGUAGES USE THE RELATIONAL DATA MODEL,
AND THEIR HALSTEAD LEVELS ARE SIMILAR. CONSTRUCTS IN THE
LANGUAGES WHICH DO NOT AFFECT THEIR PROCEDURALITY ARE
IDENTICAL. THE TWO LANGUAGES WERE LEARNED BY THE
EXPERIMENTAL SUBJECTS ALMOST EXCLUSIVELY FROM MANUALS
PRESENTING THE SAME EXAMPLES AND PROBLEMS ORDERED
IDENTICALLY FOR BOTH LANGUAGES. THE RESULTS OF THE
EXPERIMENTS SHOW THAT SUBJECTS USING THE MORE PROCEDURAL
LANGUAGE WROTE DIFFICULT QUERIES BETTER THAN SUBJECTS USING
THE LESS PROCEDURAL LANGUAGE. THE RESULTS OF THE EXPERIMENTS
ARE USED TO COMPARE CORRESPONDING CONSTRUCTS IN THE TWO
LANGUAGES AND TO RECOMMEND IMPROVEMENTS FOR THESE
CONSTRUCTS.

KEYWORDS:

HUMAN FACTORS * DATABASE SYSTEMS * QUERY LANGUAGES *
PROCEDURAL AND NONPROCEDURAL LANGUAGES

CATEGORIES:

3.72 * 4.33 * 4.6

REFERENCE CODE: 91

JOURNAL:

TODS

VOLUME: 7

ISSUE: 1

DATE: MARCH 1982

PAGES: 60 - 81

TITLE:

OPTIMAL FILE DESIGNS AND REORGANIZATION POINTS

AUTHOR(s):

BATORY, D. S.

AFFILIATION:

UNIVERSITY OF TORONTO

ABSTRACT:

A MODEL FOR STUDYING THE COMBINED PROBLEMS OF FILE DESIGN AND FILE ORGANIZATION IS PRESENTED. NEW MODELING TECHNIQUES FOR PREDICTING THE PERFORMANCE EVOLUTION OF FILES AND FOR FINDING OPTIMAL REORGANIZATION POINTS FOR FILES ARE INTRODUCED. APPLICATIONS OF THE MODEL TO HASH-BASED AND INDEXED-SEQUENTIAL FILES REVEAL IMPORTANT RELATIONSHIPS BETWEEN INITIAL LOADING FACTORS AND REORGANIZATION FREQUENCY. A PRACTICAL FILE DESIGN STRATEGY, BASED ON THESE RELATIONSHIPS, IS PROPOSED.

KEYWORDS:

DESIGN * PERFORMANCE * FILE DESIGN * FILE REORGANIZATION

CATEGORIES:

3.73 * 7.2

REFERENCE CODE: 92

JOURNAL:

TODS

VOLUME: 7

ISSUE: 4

DATE: DECEMBER 1982

PAGES: 566 - 587

TITLE:

PERFORMANCE ANALYSIS OF LINEAR HASHING WITH PARTIAL EXPANSIONS

AUTHOR(s):
LARSON, PER-AKE

AFFILIATION:
ABO AKADEMI, FINLAND

ABSTRACT:
LINEAR HASHING WITH PARTIAL EXPANSIONS IS A NEW FILE ORGANIZATION PRIMARILY INTENDED FOR FILES WHICH GROW AND SHRINK DYNAMICALLY. THIS PAPER PRESENTS A MATHEMATICAL ANALYSIS OF THE EXPECTED PERFORMANCE OF THE NEW SCHEME. THE FOLLOWING PERFORMANCE MEASURES ARE CONSIDERED: LENGTH OF SUCCESSFUL AND UNSUCCESSFUL SEARCHES, ACCESSES REQUIRED TO INSERT OR DELETE A RECORD, AND THE SIZE OF THE OVERFLOW AREA. THE PERFORMANCE IS CYCLICAL. FOR ALL PERFORMANCE MEASURES, THE NECESSARY FORMULAS ARE DERIVED FOR COMPUTING THE EXPECTED PERFORMANCE AT ANY POINT OF A CYCLE AND THE AVERAGE OVER A CYCLE. FURTHERMORE, THE EXPECTED WORST CASE IN CONNECTION WITH SEARCHING IS ANALYZED. THE OVERALL PERFORMANCE DEPENDS ON SEVERAL FILE PARAMETERS. THE NUMERICAL RESULTS SHOW THAT FOR MANY REALISTIC PARAMETER COMBINATIONS THE PERFORMANCE IS EXPECTED TO BE EXTREMELY GOOD. EVEN THE LONGEST SEARCH IS EXPECTED TO BE OF QUITE REASONABLE LENGTH.

KEYWORDS:
ALGORITHMS * PERFORMANCE * HASHING * DYNAMIC HASHING SCHEMES
* LINEAR HASHING * EXTENDIBLE HASHING

CATEGORIES:
3.73 * 3.74

REFERENCE CODE: 93

JOURNAL:
TODS
VOLUME: 7
ISSUE: 4
DATE: DECEMBER 1982
PAGES: 615 - 631

TITLE:
MATHEMATICAL MODELS OF DATABASE DEGRADATION

AUTHOR(s):
HEYMAN, DANIEL P.

AFFILIATION:
BELL LABORATORIES

ABSTRACT:

AS DATA ARE UPDATED, THE INITIAL PHYSICAL STRUCTURE OF A DATABASE IS CHANGED AND RETRIEVAL OF SPECIFIC PIECES OF DATA BECOMES MORE TIME CONSUMING. THIS PHENOMENON IS CALLED DATABASE DEGRADATION. IN THIS PAPER TWO MODELS OF DATABASE DEGRADATION ARE DESCRIBED. EACH MODEL REFERS TO A DIFFERENT ASPECT OF THE PROBLEM. IT IS ASSUMED THAT TRANSACTIONS ARE STATISTICALLY INDEPENDENT AND EITHER ADD, DELETE, OR UPDATE DATA. THE FIRST MODEL EXAMINES THE TIME DURING WHICH A BLOCK OF DATA IS FILLING UP. THE SECOND MODEL EXAMINES THE OVERFLOWS FROM A BLOCK OF DATA, WHICH ESSENTIALLY DESCRIBES THE BUILDUP OF DISORGANIZATION. ANALYTICAL RESULTS ARE OBTAINED FOR BOTH MODELS. IN ADDITION, SEVERAL NUMERICAL EXAMPLES ARE PRESENTED WHICH SHOW THAT THE MEAN NUMBER OF OVERFLOWS GROWS APPROXIMATELY LINEARLY WITH TIME. THIS APPROXIMATION IS USED TO DEVISE A SIMPLE FORMULA FOR THE OPTIMAL TIME TO REORGANIZE A STOCHASTICALLY GROWING DATABASE

KEYWORDS:

PERFORMANCE * DATA OVERFLOWS * FILE ORGANIZATION

CATEGORIES:

3.15 * 3.73 * 4.33 * 5.49

REFERENCE CODE: 94

JOURNAL:

TODS

VOLUME: 8

ISSUE: 3

DATE: SEPTEMBER 1983

PAGES: 291 - 323

TITLE:

PERFORMANCE OF RECOVERY ARCHITECTURES IN PARALLEL ASSOCIATIVE DATABASE PROCESSORS

AUTHOR(s):

CARDENAS, ALFONSO F. * ALAVIAN, FARID * AVIZIENIS, ALGIRDAS

AFFILIATION:

UNIVERSITY OF CALIFORNIA, LOS ANGELES * COMPUTER SCIENCE CORPORATION * UNIVERSITY OF CALIFORNIA, LOS ANGELES

ABSTRACT:

THE NEED FOR ROBUST RECOVERY FACILITIES IN MODERN DATABASE MANAGEMENT SYSTEMS IS QUITE WELL KNOWN. VARIOUS AUTHORS HAVE ADDRESSED RECOVERY FACILITIES AND SPECIFIC TECHNIQUES, BUT NONE HAVE DELVED INTO THE PROBLEM OF RECOVERY IN DATABASE MACHINES. IN THIS PAPER, THE TYPES OF UNDESIRABLE EVENTS THAT OCCUR IN A DATABASE ENVIRONMENT ARE CLASSIFIED AND THE NECESSARY RECOVERY INFORMATION, WITH SUBSEQUENT ACTIONS TO

RECOVER THE CORRECT STATE OF THE DATABASE, IS SUMMARIZED. A MODEL OF THE "PROCESSOR- PER-TRACK" CLASS OF PARALLEL ASSOCIATIVE DATABASE PROCESSOR IS PRESENTED. THREE DIFFERENT TYPES OF RECOVERY MECHANISMS THAT MAY BE CONSIDERED FOR PARALLEL ASSOCIATIVE DATABASE PROCESSORS ARE IDENTIFIED. FOR EACH ARCHITECTURE, BOTH THE WORKLOAD IMPOSED BY THE RECOVERY MECHANISMS ON THE EXECUTION OF DATABASE OPERATIONS (I.E., RETRIEVE, MODIFY, DELETE, AND INSERT) AND THE WORKLOAD INVOLVED IN THE RECOVERY ACTIONS (I.E., ROLLBACK, RESTART, RESTORE, AND RECONSTRUCT) ARE ANALYZED. THE PERFORMANCE OF THE THREE ARCHITECTURES IS QUANTITATIVELY COMPARED. THIS COMPARISON IS MADE IN TERMS OF THE NUMBER OF EXTRA REVOLUTIONS OF THE DATABASE AREA REQUIRED TO PROCESS A TRANSACTION VERSUS THE NUMBER OF RECORDS AFFECTED BY A TRANSACTION. A VARIETY OF DIFFERENT DESIGN PARAMETERS OF THE DATABASE PROCESSOR, OF THE DATABASE, AND OF A MIX OF TRANSACTION TYPES (MODIFY, INSERT, AND DELETE) ARE CONSIDERED. A LARGE NUMBER OF COMBINATIONS IS SELECTED AND THE EFFECTS OF THE PARAMETERS ON THE EXTRA PROCESSING TIME ARE IDENTIFIED.

KEYWORDS:

DESIGN * PERFORMANCE * ASSOCIATIVE DATABASE PROCESSORS

CATEGORIES:

3.70 * 4.33

REFERENCE CODE: 95

JOURNAL:

TODS

VOLUME: 8

ISSUE: 3

DATE: SEPTEMBER 1983

PAGES: 410 - 433

TITLE:

HIERARCHICAL FILE ORGANIZATION AND ITS APPLICATION TO
SIMILAR-STRING MATCHING

AUTHOR(s):

ITO, TETSURO * KIZAWA, MAKOTO

AFFILIATION:

UNIVERSITY OF LIBRARY AND INFORMATION SCIENCE, IBARAKI, JAPAN

ABSTRACT:

THE AUTOMATIC CORRECTION OF MISSPELLED INPUTS IS DISCUSSED FROM A VIEWPOINT OF SIMILAR-STRING MATCHING. FIRST A HIERARCHICAL FILE ORGANIZATION BASED ON A LINEAR ORDERING OF RECORDS IS PRESENTED FOR RETRIEVING RECORDS HIGHLY SIMILAR

TO ANY INPUT QUERY. THEN THE SPELLING PROBLEM IS ATTACKED BY CONSTRUCTING A HIERARCHICAL FILE FOR A SET OF STRINGS IN A DIRECTORY OF ENGLISH WORDS. THE SPELLING CORRECTION STEPS PROCEED AS FOLLOWS: (1) FIND ONE OF THE BEST-MATCH STRINGS WHICH ARE MOST SIMILAR TO A QUERY, (2) EXPAND THE SEARCH AREA FOR OBTAINING THE GOOD-MATCH STRINGS, AND (3) INTERRUPT THE FILE SEARCH AS SOON AS THE REQUIRED STRING IS DISPLAYED. COMPUTATIONAL EXPERIMENTS VERIFY THE PERFORMANCE OF THE PROPOSED METHODS FOR SIMILAR STRING MATCHING UNDER THE UNIX TIME-SHARING SYSTEM.

KEYWORDS:

ALGORITHMS * PERFORMANCE * FILE ORGANIZATION * HIERARCHY * CLUSTERING * LINEAR ORDERING * BEST MATCH * GOOD MATCH * SPELLING CORRECTION * TEXT EDITOR * OFFICE AUTOMATION

CATEGORIES:

2.0 * 3.15 * 3.74 * 5.4

REFERENCE CODE: 96

JOURNAL:

TODS

VOLUME: 8

ISSUE: 3

DATE: SEPTEMBER 1983

PAGES: 434 - 464

TITLE:

INDEXING AND RETRIEVAL STRATEGIES FOR NATURAL LANGUAGE FACT RETRIEVAL

AUTHOR(s):

KOLODNER, JANET L.

AFFILIATION:

GEORGIA INSTITUTE OF TECHNOLOGY

ABSTRACT:

RESEARCHERS IN ARTIFICIAL INTELLIGENCE HAVE RECENTLY BECOME INTERESTED IN NATURAL LANGUAGE FACT RETRIEVAL; CURRENTLY, THEIR RESEARCH IS AT A POINT WHERE IT CAN BEGIN CONTRIBUTING TO THE FIELD OF INFORMATION RETRIEVAL. IN THIS PAPER, STRATEGIES FOR A NATURAL LANGUAGE FACT RETRIEVAL SYSTEM ARE MAPPED OUT. AND APPROACHES TO MANY OF THE ORGANIZATION AND RETRIEVAL PROBLEMS ARE PRESENTED. THE CYRUS SYSTEM, WHICH KEEPS TRACK OF IMPORTANT PEOPLE AND IS QUERIED IN ENGLISH, IS PRESENTED AND USED TO ILLUSTRATE THOSE SOLUTIONS.

KEYWORDS:

DESIGN * NATURAL LANGUAGE PROCESSING * ARTIFICIAL

INTELLIGENCE * FACT RETRIEVAL * CONCEPTUAL MEMORY * DATABASE
RETRIEVAL * QUESTION ANSWERING

CATEGORIES:
3.6 * 4.33 * 7.2

REFERENCE CODE: 97

JOURNAL:
TODS
VOLUME: 8
ISSUE: 4
DATE: DECEMBER 1983
PAGES: 543 - 551

TITLE:
ON THE COMPLEXITY OF DESIGNING OPTIMAL PARTIAL-MATCH
RETRIEVAL SYSTEMS

AUTHOR(s):
MORAN, SHLOMO

AFFILIATION:
THE TECHNION --- ISRAEL INSTITUTE OF TECHNOLOGY, HAIFA

ABSTRACT:
WE CONSIDER THE PROBLEM OF DESIGNING AN INFORMATION
RETRIEVAL SYSTEM ON WHICH PARTIAL MATCH QUERIES HAVE TO BE
ANSWERED. EACH RECORD IN THE SYSTEM CONSISTS OF A LIST OF
ATTRIBUTES, AND A PARTIAL MATCH QUERY SPECIFIES THE VALUES
OF SOME OF THE ATTRIBUTES. THE RECORDS ARE STORED IN BUCKETS
IN A SECONDARY MEMORY, AND IN ORDER TO ANSWER A PARTIAL
MATCH QUERY ALL THE BUCKETS THAT MAY CONTAIN A RECORD
SATISFYING THE SPECIFICATIONS OF THE QUERY MUST BE
RETRIEVED. THE BUCKET IN WHICH A GIVEN RECORD IS STORED IS
FOUND BY MULTIPLE KEY HASHING FUNCTION, WHICH MAPS EACH
ATTRIBUTE TO A STRING OF A FIXED NUMBER OF BITS. THE ADDRESS
OF THAT BUCKET IS THEN REPRESENTED BY THE STRING OBTAINED BY
CONCATENATING THE STRINGS ON WHICH THE VARIOUS ATTRIBUTES
WERE MAPPED. A PARTIAL MATCH QUERY MAY SPECIFY ONLY PART OF
THE BITS IN THE STRING REPRESENTING THE ADDRESS, AND THE
LARGER THE THE NUMBER OF BITS SPECIFIED, THE SMALLER THE
NUMBER OF BUCKETS THAT HAVE TO BE RETRIEVED IN ORDER TO
ANSWER THE QUERY. THE OPTIMIZATION PROBLEM CONSIDERED IN
THIS PAPER IS THAT OF DECIDING TO HOW MANY BITS EACH
ATTRIBUTE SHOULD BE MAPPED BY THE HASHING FUNCTION ABOVE, SO
THAT THE EXPECTED NUMBER OF BUCKETS RETRIEVED PER QUERY IS
MINIMIZED. EFFICIENT SOLUTIONS FOR SPECIAL CASES OF THIS
PROBLEM HAVE BEEN OBTAINED IN [1], [12], AND [14]. IT IS
SHOWN THAT IN GENERAL THE PROBLEM IS NP-HARD, AND THAT IF P
◊ NP, IT IS ALSO NOT FULLY APPROXIMABLE. TWO HEURISTIC

ALGORITHMS FOR THE PROBLEM ARE ALSO GIVEN AND COMPARED.

KEYWORDS:

PARTIAL MATCH RETRIEVAL * HASHING * SEARCHING * FILE
ORGANIZATION * NP-HARD PROBLEMS * APPROXIMATION ALGORITHMS

CATEGORIES:

3.73 * 3.74

REFERENCE CODE: 98

JOURNAL:

TODS

VOLUME: 8

ISSUE: 4

DATE: DECEMBER 1983

PAGES: 552 - 576

TITLE:

PARTIAL-MATCH RETRIEVAL USING HASHING AND DESCRIPTORS

AUTHOR(s):

RAMAMOHANARAO, K. * LLOYD, JOHN W. * THOM, JAMES A.

AFFILIATION:

UNIVERSITY OF MELBOURNE

ABSTRACT:

THIS PAPER STUDIES A PARTIAL-MATCH RETRIEVAL SCHEME BASED ON HASH FUNCTIONS AND DESCRIPTORS. THE EMPHASIS IS PLACED ON SHOWING HOW THE USE OF A DESCRIPTOR FILE CAN IMPROVE THE PERFORMANCE OF THE SCHEME. RECORDS IN THE FILE ARE GIVEN ADDRESSES ACCORDING TO HASH FUNCTIONS FOR EACH FIELD IN THE RECORD. FURTHERMORE, EACH PAGE OF THE FILE HAS ASSOCIATED WITH IT A DESCRIPTOR, WHICH IS A FIXED-LENGTH BIT STRING, DETERMINED BY THE RECORDS ACTUALLY PRESENT IN THE PAGE. BEFORE A PAGE IS ACCESSED TO SEE IF IT CONTAINS RECORDS IN THE ANSWER TO A QUERY, THE DESCRIPTOR FOR THE PAGE IS CHECKED. THIS CHECK MAY SHOW THAT NO RELEVANT RECORDS ARE ON THE PAGE AND, HENCE, THAT THE PAGE DOES NOT HAVE TO BE ACCESSED. THE METHOD IS SHOWN TO HAVE A VERY SUBSTANTIAL PERFORMANCE ADVANTAGE OVER PURE HASHING SCHEMES, WHEN SOME FIELDS IN THE RECORDS HAVE LARGE KEY SPACES. A MATHEMATICAL MODEL OF THE SCHEME, PLUS AN ALGORITHM FOR OPTIMIZING PERFORMANCE, IS GIVEN.

KEYWORDS:

DESIGN * PERFORMANCE * PARTIAL-MATCH RETRIEVAL * HASHING *
DESCRIPTOR * DYNAMIC FILE * OPTIMIZATION

CATEGORIES:

3.73 * 3.79 * 7.2

REFERENCE CODE: 99

JOURNAL:

CACM

VOLUME: 19

ISSUE: 11

DATE: NOVEMBER 1976

PAGES: 634 - 642

TITLE:

OPTIMAL REORGANIZATION OF DISTRIBUTED SPACE DISK FILES

AUTHOR(s):

MARUYAMA, K. * SMITH, S. E.

AFFILIATION:

IBM THOMAS J. WATSON RESEARCH CENTER

ABSTRACT:

IN MOST DATABASE ORGANIZATIONS, THE COST OF ACCESSING THE DATABASE WILL INCREASE DUE TO STRUCTURAL CHANGES CAUSED BY UPDATES AND INSERTIONS. BY REORGANIZING THE DATABASE, THE ACCESS COSTS CAN BE REDUCED. A BASIC PROBLEM IS TO ESTABLISH THE PROPER TRADEOFF BETWEEN PERFORMANCE, STORAGE COSTS, AND REORGANIZATION COSTS. THIS PAPER CONSIDERS THE OPTIMUM POINTS AT WHICH TO REORGANIZE A DATABASE. A DISK FILE ORGANIZATION WHICH ALLOWS FOR DISTRIBUTED FREE SPACE IS DESCRIBED. A COST FUNCTION DESCRIBING THE EXCESS COSTS DUE TO PHYSICAL DISORGANIZATION IS DEFINED, AND THIS FUNCTION IS MINIMIZED TO OBTAIN THE OPTIMUM REORGANIZATION POINTS. NUMERICAL EXAMPLES BASED ON THE CHARACTERISTICS OF EXISTING DISK STORAGE DEVICES ARE GIVEN.

KEYWORDS:

DISK FILE * FREE SPACE * RETRIEVAL * INSERTION *
DETERIORATION * REORGANIZATION

CATEGORIES:

3.70 * 3.73

REFERENCE CODE: 100

JOURNAL:

CACM

VOLUME: 23

ISSUE: 2

DATE: FEBRUARY 1980

PAGES: 71 - 80

TITLE:

A VIRTUAL MACHINE EMULATOR FOR PERFORMANCE EVALUATION

AUTHOR(s):

CANON, M. D. * FRITZ, D. H. * HOWARD, J. H. * HOWELL, T. D.
* MITOMA, M. F. * RODRIGUEZ-ROSELL, J.

AFFILIATION:

IBM SAN JOSE RESEARCH LABORATORY

ABSTRACT:

THE VIRTUAL MACHINE EMULATOR IS AN ENHANCED VERSION OF IBM'S VM/370 PROGRAM THAT EXTENDS THE VIRTUAL MACHINE ENVIRONMENT TO INCLUDE TIMING SIMULATION IN ADDITION TO THE EXISTING SIMULATION OF MACHINE FUNCTION. BY SELECTING PROCESSOR AND I/O DEVICE TIMING CHARACTERISTICS, THE USER CAN EVALUATE THE PERFORMANCE OF A WIDE RANGE OF IBM 370 COMPATIBLE SYSTEMS WITH GREATER FLEXIBILITY AND LOWER COST THAN HARDWARE PROTOTYPING. VALIDATION DATA ARE PRESENTED SHOWING THAT THE EMULATOR IS AN ACCURATE PERFORMANCE PREDICTOR WITH A LOW SIMULATION OVERHEAD.

KEYWORDS:

PERFORMANCE EVALUATION * COMPUTER SYSTEM SIMULATION *
VIRTUAL MACHINES

CATEGORIES:

4.35 * 4.6 * 6.21 * 8.1

REFERENCE CODE: 101

JOURNAL:

CACM

VOLUME: 23

ISSUE: 3

DATE: MARCH 1980

PAGES: 147 - 154

TITLE:

GENERAL CONSIDERATIONS ON THE DESIGN OF AN INTERACTIVE
SYSTEM FOR DATA ANALYSIS

AUTHOR(s):

LING, ROBERT F.

AFFILIATION:

CLEMSON UNIVERSITY

ABSTRACT:

AMONG THE MOST IMPORTANT CRITERIA IN THE DESIGN AND IMPLEMENTATION OF AN INTERACTIVE SYSTEM FOR DATA ANALYSIS ARE: DATA STRUCTURE, CONTROL LANGUAGE, USER INTERFACE, SYSTEM VERSATILITY, EXTENSIBILITY, AND PORTABILITY. THE DESIGN OF AN INTERACTIVE SYSTEM, VIEWED AS A SET OF CONSTRAINED DECISIONS BASED ON THESE CRITERIA, WILL BE DISCUSSED. THE CONCEPTS AND CONSIDERATIONS DISCUSSED IN THIS ARTICLE ABOUT THE DESIGN OF INTERACTIVE SYSTEMS ARE GENERAL IN NATURE AND ARE NEITHER PROBLEM-SPECIFIC NOR DISCIPLINE-SPECIFIC. SPECIFIC EXAMPLES FROM STATISTICAL PACKAGES AND THEIR DESIGNS ARE CITED FOR ILLUSTRATION PURPOSES ONLY.

KEYWORDS:

DESIGN OF INTERACTIVE SYSTEMS * SOFTWARE DESIGN CRITERIA *
USER INTERFACE

CATEGORIES:

3.0 * 4.0

REFERENCE CODE: 102

JOURNAL:

CACM

VOLUME: 23

ISSUE: 4

DATE: APRIL 1980

PAGES: 207 - 213

TITLE:

STUDYING PROGRAMMER BEHAVIOR EXPERIMENTALLY: THE PROBLEMS OF
PROPER METHODOLOGY

AUTHOR(s):

BROOKS, RUVEN E.

AFFILIATION:

THE UNIVERSITY OF TEXAS MEDICAL BRANCH, GALVESTON, TEXAS

ABSTRACT:

THE APPLICATION OF BEHAVIORAL OR PSYCHOLOGICAL TECHNIQUES TO THE EVALUATION OF PROGRAMMING LANGUAGES AND TECHNIQUES IS AN APPROACH WHICH HAS FOUND INCREASED APPLICABILITY OVER THE PAST DECADE. IN ORDER TO USE THIS APPROACH SUCCESSFULLY, INVESTIGATORS MUST PAY CLOSE ATTENTION TO METHODOLOGICAL ISSUES, BOTH IN ORDER TO INSURE THE GENERALIZABILITY OF THEIR FINDINGS AND TO DEFEND THE QUALITY OF THEIR WORK TO RESEARCHERS IN OTHER FIELDS. THREE MAJOR AREAS OF METHODOLOGICAL CONCERN, THE SELECTION OF SUBJECTS, MATERIALS, AND MEASURES, ARE REVIEWED. THE FIRST TWO OF THESE AREAS CONTINUE TO PRESENT MAJOR DIFFICULTIES FOR THIS

TYPE OF RESEARCH.

KEYWORDS:

PSYCHOLOGY OF PROGRAMMING * SOFTWARE PSYCHOLOGY

CATEGORIES:

4.6

REFERENCE CODE: 103

JOURNAL:

CACM

VOLUME: 23

ISSUE: 7

DATE: JULY 1980

PAGES: 396 - 410

TITLE:

THE KEYSTROKE-LEVEL MODEL FOR USER PERFORMANCE TIME WITH
INTERACTIVE SYSTEMS

AUTHOR(s):

CARD, STUART K. * MORAN, THOMAS P.

AFFILIATION:

XEROX PALO ALTO RESEARCH CENTER * XEROX PALO ALTO RESEARCH
CENTER * CARNEGIE-MELLON UNIVERSITY

ABSTRACT:

THERE ARE SEVERAL ASPECTS OF USER-COMPUTER PERFORMANCE THAT
SYSTEM DESIGNERS SHOULD SYSTEMATICALLY CONSIDER. THIS
ARTICLE PROPOSES A SIMPLE MODEL, THE KEYSTROKE-LEVEL MODEL,
FOR PREDICTING ONE ASPECT OF PERFORMANCE: THE TIME IT TAKES
AN EXPERT USER TO PERFORM A GIVEN TASK ON A GIVEN COMPUTER
SYSTEM. THE MODEL IS BASED ON COUNTING KEYSTROKES AND OTHER
LOW-LEVEL OPERATIONS, INCLUDING THE USER'S MENTAL
PREPARATIONS AND THE SYSTEM'S RESPONSE. PERFORMANCE IS CODED
IN TERMS OF THESE OPERATIONS AND OPERATOR TIMES SUMMED TO
GIVE PREDICTIONS. HEURISTIC RULES ARE GIVEN FOR PREDICTING
WHERE MENTAL PREPARATIONS OCCUR. WHEN TESTED AGAINST DATA IN
10 DIFFERENT SYSTEMS, THE MODEL'S PREDICTION ERROR IS 21
PERCENT FOR INDIVIDUAL TASKS. AN EXAMPLE IS GIVEN TO
ILLUSTRATE HOW THE MODEL CAN BE USED TO PRODUCE PARAMETRIC
PREDICTIONS AND HOW SENSITIVITY ANALYSIS CAN BE USED TO
REDEEM CONCLUSIONS IN THE FACE OF UNCERTAIN ASSUMPTIONS.
FINALLY, THE MODEL IS COMPARED TO SEVERAL SIMPLER VERSIONS.
THE POTENTIAL ROLE FOR THE KEYSTROKE-LEVEL MODEL IN SYSTEM
DESIGN IS DISCUSSED.

KEYWORDS:

HUMAN-COMPUTER INTERFACE * HUMAN-COMPUTER INTERACTION * USER

MODEL * USER PERFORMANCE * COGNITIVE PSYCHOLOGY * ERGONOMICS
* HUMAN FACTORS * SYSTEMS DESIGN

CATEGORIES:

3.36 * 4.6 * 8.1

REFERENCE CODE: 104

JOURNAL:

CACM

VOLUME: 23

ISSUE: 9

DATE: SEPTEMBER 1980

PAGES: 511 - 521

TITLE:

COMPUTER SYSTEM DESIGN USING A HIERARCHICAL APPROACH TO
PERFORMANCE EVALUATION

AUTHOR(s):

KUMAR, B. * DAVIDSON, E. S.

AFFILIATION:

ELXSI INTERNATIONAL * UNIVERSITY OF ILLINOIS

ABSTRACT:

THE CONCEPT OF A HIERARCHY OF PERFORMANCE MODELS IS INTRODUCED. IT IS ARGUED THAT SUCH A HIERARCHY SHOULD CONSIST OF MODELS SPANNING A WIDE RANGE OF ACCURACY AND COST IN ORDER TO BE A COST-EFFECTIVE TOOL IN THE DESIGN OF COMPUTER SYSTEMS. JUDICIOUS USE OF THE HIERARCHY CAN SATISFY THE CONFLICTING NEEDS OF HIGH ACCURACY AND LOW COST OF PERFORMANCE EVALUATION. A SYSTEM DESIGN PROCEDURE THAT USES THE HIERARCHY IS DEVELOPED. THE CONCEPTS DEVELOPED ARE ILLUSTRATED BY APPLYING THEM TO A CASE STUDY OF SYSTEM DESIGN. THE RESULTS OF OPTIMIZATIONS CONDUCTED USING A TWO-LEVEL PERFORMANCE MODEL HIERARCHY AND A SIMPLE COST MODEL ARE DISCUSSED. IN ALMOST ALL THE EXPERIMENTS CONDUCTED, THE OPTIMIZATION PROCEDURE CONVERGED TO A REGION VERY CLOSE TO A LOCALLY OPTIMUM SYSTEM. THE EFFICIENCY OF THE PROCEDURE IS SHOWN TO BE CONSIDERABLY GREATER THAN THAT OF THE BRUTE FORCE APPROACH TO SYSTEM DESIGN.

KEYWORDS:

HIERARCHICAL MODELING * PERFORMANCE EVALUATION * SYSTEM
DESIGN * OPTIMIZATION ALGORITHMS * HIGH SPEED COMPUTER
SYSTEMS

CATEGORIES:

6.2 * 8.1 * 8.3

REFERENCE CODE: 105

JOURNAL:

JASIS

VOLUME: 29

ISSUE: 1

DATE: JANUARY 1978

PAGES: 31 - 40

TITLE:

EVALUATION OF INFORMATION RETRIEVAL SYSTEMS: A DECISION
THEORY APPROACH

AUTHOR(s):

KRAFT, DONALD H. * BOOKSTEIN, ABRAHAM

AFFILIATION:

SCHOOL OF LIBRARIANSHIP, UNIVERSITY OF CALIFORNIA, BERKELEY
* GRADUATE LIBRARY SCHOOL, UNIVERSITY OF CHICAGO, CHICAGO

ABSTRACT:

THE SWETS MODEL OF INFORMATION RETRIEVAL, BASED ON A
DECISION THEORY APPROACH, IS DISCUSSED, WITH THE OVERALL
PERFORMANCE MEASURE BEING THE CRUCIAL ELEMENT REEXAMINED IN
THIS PAPER. THE NEYMAN-PEARSON CRITERION FROM STATISTICAL
DECISION THEORY, AND BASED ON LIKELIHOOD RATIOS, IS USED TO
DETERMINE AN OPTIMAL RANGE OF Z, THE VARIABLE ASSIGNED TO
EACH DOCUMENT BY THE RETRIEVAL SYSTEM IN AN ATTEMPT TO
DISCRIMINATE BETWEEN RELEVANT AND NONRELEVANT DOCUMENTS.
THIS CRITERION IS SHOWN TO BE DIRECTLY RELATED TO BOTH
PRECISION AND RECALL, AND IS EQUIVALENT TO THE MAXIMIZATION
OF THE EXPECTED VALUE OF THE RETRIEVAL DECISION FOR A
SPECIFIC QUERY AND A GIVEN DOCUMENT UNDER CERTAIN
CONDITIONS. THUS, A COMPROMISE CAN BE REACHED BETWEEN THOSE
WHO ADVOCATE PRECISION AS A MEASURE, DUE PARTIALLY TO ITS
ABILITY TO BE EASILY MEASURABLE EMPIRICALLY, AND THOSE WHO
ADVOCATE CONSIDERATION OF RECALL. SEVERAL CASES OF THE
NORMAL AND POISSON DISTRIBUTIONS FOR THE VARIABLE Z ARE
DISCUSSED IN TERMS OF THEIR IMPLICATIONS FOR THE
NEYMAN-PEARSON DECISION RULE. IT IS SEEN THAT WHEN THE
VARIANCES ARE UNEQUAL, THE SWETS RULE OF RETRIEVING A
DOCUMENT IF ITS Z VALUE IS LARGE ENOUGH IS NOT OPTIMAL.
FINALLY, THE SITUATION OF PRECISION AND RECALL NOT BEING
INVERSELY RELATED IS SHOWN TO BE POSSIBLE UNDER CERTAIN
CONDITIONS. THUS, THIS PAPER ATTEMPTS TO EXTEND THE
UNDERSTANDING OF THE THEORETICAL FOUNDATIONS OF THE DECISION
THEORY APPROACH TO INFORMATION RETRIEVAL.

KEYWORDS:

INFORMATION RETRIEVAL * INFORMATION THEORY * QUERY *
VARIABLES

CATEGORIES:
3.7 * 5.6

REFERENCE CODE: 106

JOURNAL:
JASIS
VOLUME: 29
ISSUE: 6
DATE: NOVEMBER 1978
PAGES: 289 - 296

TITLE:
THE APPLICATION OF MULTIPLE-CRITERIA UTILITY THEORY TO THE
EVALUATION OF INFORMATION SYSTEMS

AUTHOR(s):
HERNER, SAUL * SNAPPER, KURT J.

AFFILIATION:
HERNER AND COMPANY, WASHINGTON, DC

ABSTRACT:
THE USE OF MULTIPLE-CRITERIA THEORY, A MEANS OF MEASURING
DEGREE OF SATISFACTION OF PREDETERMINED EVALUATIVE CRITERIA,
QUANTIFYING THEIR RELATIVE IMPORTANCE, IDENTIFYING TRADEOFFS
AMONG THEM, AND DETERMINING THE BEST TRADEOFFS, IS PROPOSED
FOR THE EVALUATION OF INFORMATION SYSTEMS. USE OF THE
PROPOSED METHOD IS DEMONSTRATED VIA THE EVALUATION OF A
HYPOTHETICAL SELECTIVE DISSEMINATION OF INFORMATION (SDI)
SYSTEM. THE ILLUSTRATIVE EVALUATION INVOLVES (1) SELECTION
OF TWO SETS OF TYPICALLY ANTITHETIC CRITERIA: EFFICIENCY
(THE INNER WORKINGS OF THE SYSTEM) AND EFFECTIVENESS (ITS
IMPACT ON ITS USERS); (2) RANKING AND SCORING EACH CRITERION
IN THE TWO SETS; (3) SELECTION OF ALTERNATIVE CONFIGURATIONS
OF THE SYSTEM UNDER STUDY; (4) SCORING THE SPECIMEN AND THE
ALTERNATIVE SYSTEMS IN TERMS OF THE RATED EFFICIENCY AND
EFFECTIVENESS CRITERIA; AND (5) IDENTIFYING THE SYSTEM THAT
SCORES THE HIGHEST. THE COMPARATIVE SCORES FOR THE SYSTEMS
ARE DETERMINED BY $U_i = [(w')(s_i') + (w'')(s_i'')]$, WHERE s_i'
AND s_i'' DENOTE THE EFFICIENCY AND EFFECTIVENESS SCORES OF
THE i TH ALTERNATIVE, AND w' AND w'' ARE WEIGHTING CONSTANTS
THAT REFLECT THE COMPUTED RELATIVE IMPORTANCE OF EFFICIENCY
AND EFFECTIVENESS.

KEYWORDS:
UTILITY THEORY * SYSTEM EVALUATION * STATISTICAL MEASUREMENT
* INFORMATION SYSTEM

CATEGORIES:

3.72 * 4.4

REFERENCE CODE: 107

JOURNAL:

JASIS

VOLUME: 30

ISSUE: 5

DATE: SEPTEMBER 1979

PAGES: 264 - 268

TITLE:

TWO MODELS FOR PREDICTING SUBJECT CIRCULATION: A
CONTRIBUTION TO THE ALLOCATION PROBLEM

AUTHOR(s):

McGRATH, WILLIAM E.

AFFILIATION:

UNIVERSITY OF LOWELL

ABSTRACT:

IT IS SHOWN THAT DIFFERENT SETS OF VARIABLES CAN ACCOUNT FOR NEARLY EQUAL AMOUNTS OF VARIANCE WHEN PREDICTING BOOK CIRCULATION BY SUBJECT. PROPORTION OF VARIANCE (R^2) FOR TWO BASIC MODELS CONTAINING VARIOUS COMBINATIONS OF 21 VARIABLES WERE TESTED. THE FIRST, CALLED THE SHEFLIST MODEL, TREATED THE NUMBER OF LIBRARY BOOKS, WHOSE SUBJECTS MATCH THOSE OF ACADEMIC DEPARTMENTS, AS A CONTROL VARIABLE. AS SUCH, IT ACCOUNTED FOR 67% OF THE VARIANCE, THUS ENTERING THE EQUATION FIRST. WITH THIS MODEL, FOUR SEPARATE SIGNIFICANT SETS EMERGED, EACH ACCOUNTING FOR APPROXIMATELY THE SAME AMOUNT OF VARIANCE (10%). THEY WERE (1) NUMBER OF FACULTY, HARD/SOFT, MASTERS ENROLLMENTS; (2) MASTERS ENROLLMENT, UPPER-LEVEL MAJORS, HARD/SOFT; (3) CREDIT HOURS * TOTAL ENROLLMENTS, HARD/SOFT; (4) UPPER-LEVEL MAJORS, TOTAL MAJORS, ENROLLMENTS LOWER. IN THE SECOND, SHEFLIST WAS CONSTRAINED BY DEFINING THE DEPENDENT VARIABLE AS THE PROPORTION OF SHEFLIST CIRCULATED. WITH THIS MODEL, THREE SEPARATE SIGNIFICANT SETS EMERGED. THESE WERE (5) MASTERS ENROLLMENTS AND HARD/SOFT (20%) VARIANCE; (6) HARD-SOFT AND PH. D. PROGRAM (16%); (7) UPPER-LEVEL MAJORS, AND CREDIT HOURS * TOTAL MAJORS (15%). IN EACH OF THE TESTS, NO OTHER VARIABLES WERE SIGNIFICANT. OF THE 21 VARIABLES, 10 DID NOT APPEAR IN ANY OF THE 7 SETS. ANY OF THE SEVEN SETS COULD BE USED IN AN ALLOCATION FORMULA. THE DECIDING CRITERION FOR CHOOSING A SET MAY DEPEND ON THE CONVENIENCE OF COLLECTING DATA FOR EACH OF THE VARIABLES IN THE SET.

KEYWORDS:

MODELS * EDUCATION * SETS * VARIABLES

CATEGORIES:
1.5

REFERENCE CODE: 108

JOURNAL:
JASIS
VOLUME: 31
ISSUE: 1
DATE: JANUARY 1980
PAGES: 5 - 24

TITLE:
INFORMATION SYSTEM DESIGN METHODOLOGY

AUTHOR(s):
WASSERMAN, ANTHONY I.

AFFILIATION:
MEDICAL INFORMATION SCIENCE, UNIVERSITY OF CALIFORNIA AT SAN
FRANCISCO

ABSTRACT:
THERE IS A GREAT NEED FOR A SYSTEMATIC APPROACH TO THE
SPECIFICATION, DESIGN, AND DEVELOPMENT OF INFORMATION
SYSTEMS. THIS ARTICLE DESCRIBES THE MOTIVATING REASONS FOR
SUCH AN APPROACH AND SURVEYS SOME OF THE TECHNIQUES THAT
HAVE BEEN DEVELOPED TO ASSIST THE SOFTWARE SPECIFICATION AND
DESIGN ACTIVITY. A METHODOLOGY IS SEEN AS A COMBINATION OF
TOOLS AND TECHNIQUES EMPLOYED WITHIN AN ORGANIZATIONAL AND
MANAGERIAL FRAMEWORK THAT CAN BE CONSISTENTLY APPLIED TO
SUCCESSIVE INFORMATION SYSTEM DEVELOPMENT PROJECTS. THE WAYS
THAT INFORMATION SYSTEM DEVELOPMENT ORGANIZATIONS CAN CREATE
AND USE SUCH METHODOLOGIES ARE EMPHASIZED.

KEYWORDS:
DESIGN METHODOLOGY * INFORMATION SYSTEM * SOFTWARE
SPECIFICATION

CATEGORIES:
7.2

REFERENCE CODE: 109

JOURNAL:
JASIS
VOLUME: 31
ISSUE: 4

DATE: JULY 1980
PAGES: 248 - 255

TITLE:
MEASUREMENT IN INFORMATION SCIENCE: OBJECTIVE AND SUBJECTIVE
METRICAL SPACE

AUTHOR(s):
BROOKES, BERTRAM C.

AFFILIATION:
SCHOOL OF LIBRARY AND INFORMATION SCIENCE, UNIVERSITY OF
WESTERN ONTARIO

ABSTRACT:
IT IS ARGUED THAT IN INFORMATION SCIENCE WE HAVE TO
DISTINGUISH PHYSICAL, OBJECTIVE, OR DOCUMENT SPACE FROM
PERSPECTIVE, SUBJECTIVE, OR INFORMATION SPACE. THESE TWO
SPACES ARE LIKE MAPS AND LANDSCAPES: EACH IS A SYSTEMATIC
DISTORTION OF THE OTHER. HOWEVER, TRANSFORMATIONS CAN BE
EASILY MADE ONCE THE TWO SPACES ARE DISTINGUISHED. IF THE
TRANSFORMATIONS ARE OMITTED WE ONLY GET UNHELPFUL PHYSICAL
SOLUTIONS TO INFORMATION PROBLEMS.

KEYWORDS:
INFORMATION SCIENCE * METRICAL SPACE * TRANSFORMATION

CATEGORIES:
3.11 * 3.19

REFERENCE CODE: 110

JOURNAL:
JASIS
VOLUME: 31
ISSUE: 5
DATE: SEPTEMBER 1980
PAGES: 347 - 356

TITLE:
TOWARD USABLE USER STUDIES

AUTHOR(s):
MICK, COLIN K. * LINDSEY, GEORG N. * CALLAHAN, DANIEL

AFFILIATION:
APPLIED COMMUNICATION RESEARCH, INC. * DECISION INFORMATION
SERVICES, LTD.

ABSTRACT:
A MANAGEMENT-ORIENTED MODEL FOR DESCRIBING AND STUDYING

INFORMATION BEHAVIOR IS PROPOSED. THE MODEL FOCUSES ON VARIABLES WHICH CAN BE MANIPULATED BY MANAGERS --- PRIMARILY ENVIRONMENTAL AND SITUATIONAL VARIABLES --- RATHER THAN ON VARIABLES DESCRIBING INDIVIDUAL ATTRIBUTES. SEVERAL HYPOTHESES DERIVED FROM THE MODEL ARE TESTED USING A DATABASE DESCRIBING THE INFORMATION-RELATED ATTITUDES AND BEHAVIORS OF SOME 560 SCIENTISTS AND ENGINEERS WORKING IN A VARIETY OF SETTINGS AND ROLES. ALL BUT ONE OF THE HYPOTHESES WERE CONFIRMED, ADDING SUPPORT TO THE MODEL. THE RESULTS OF THESE TESTS SUGGEST THAT ENVIRONMENTAL AND SITUATIONAL CONSTRAINTS PLAY A MAJOR PART IN DETERMINING INFORMATION BEHAVIOR. THEY SUGGEST THAT INTERVENTIONS AIMED AT IMPROVING INFORMATION FLOW WITHIN ORGANIZATIONS MUST BE CAREFULLY TAILORED TO THE SPECIFIC SITUATION IF THEY ARE TO HAVE MAXIMUM IMPACT.

KEYWORDS:

MANAGEMENT MODEL * INFORMATION BEHAVIOR * HYPOTHESES * DATA BASE * ENVIRONMENT * SITUATIONAL

CATEGORIES:

3.5 * 3.59 * 3.61 * 4.33

REFERENCE CODE: 111

JOURNAL:

JASIS

VOLUME: 32

ISSUE: 1

DATE: JANUARY 1981

PAGES: 23 - 32

TITLE:

ONLINE SEARCHING: MEASURES THAT DISCRIMINATE AMONG USERS WITH DIFFERENT TYPES OF EXPERIENCES

AUTHOR(s):

FENICHEL, CAROL HANSEN

AFFILIATION:

COLLEGE OF LIBRARY SCIENCE, UNIVERSITY OF KENTUCKY, LEXINGTON

ABSTRACT:

THE PRIMARY GOAL OF THIS RESEARCH WAS TO DISCOVER THOSE BEHAVIORS ASSOCIATED WITH THE PROCESS OF ONLINE BIBLIOGRAPHIC SEARCHING THAT ARE CORRELATED WITH SUCCESS. IN THE ASSUMPTION THAT MORE EXPERIENCED SEARCHERS ARE MORE SUCCESSFUL, THE RESEARCH OBJECTIVES WERE TO IDENTIFY (1) THE DIFFERENCES AMONG THE SEARCHES OF USERS OF ONLINE SYSTEMS WHO HAVE DIFFERENT AMOUNTS OF OVERALL EXPERIENCE AND (2) THE DIFFERENCES BETWEEN THE SEARCHES OF PERSONS WITH AND WITHOUT

EXPERIENCE ON THE DATABASE BEING SEARCHED. FIVE GROUPS OF SEARCHERS WITH VARIED OVERALL AND ERIC (EDUCATIONAL RESOURCES INFORMATION CENTER) DATABASE EXPERIENCE PERFORMED PRESELECTED SEARCHES ON THE DIALOG SYSTEM USING ONTAP, THE 1975 SUBSET OF THE ERIC DATABASE. ANALYSIS OF THE SEARCH TRANSCRIPTS SHOWED THAT DIFFERENCES AMONG THE GROUPS WERE NOT LARGE. COMPARED TO THE EXPERIENCED SUBJECTS, BEGINNING SEARCHERS PERFORMED SURPRISINGLY WELL. THE GROUP WITH THE GREATEST OVERALL EXPERIENCE AND THE GREATEST ERIC DATABASE EXPERIENCE ACHIEVED THE HIGHEST RECALL AND HAD THE HIGHEST VALUES OF A SET OF SEARCH PROCESS VARIABLES DESIGNATED "SEARCH EFFORT" VARIABLES (EG., NUMBER OF COMMANDS AND DESCRIPTORS, CONNECT TIME) SUGGESTING A POSSIBLE RELATIONSHIP BETWEEN SEARCH EFFORT AND RECALL.

KEYWORDS:

ONLINE SYSTEM * SEARCHING * EXPERIENCE * DATA BASE

CATEGORIES:

2.49 * 3.74 * 4.33

REFERENCE CODE: 112

JOURNAL:

JASIS

VOLUME: 32

ISSUE: 1

DATE: JANUARY 1981

PAGES: 51 - 64

TITLE:

THE RELATIONAL MODEL IN INFORMATION RETRIEVAL

AUTHOR(s):

CRAWFORD, ROBERT G.

AFFILIATION:

DEPARTMENT OF COMPUTING AND INFORMATION SCIENCE, QUEEN'S UNIVERSITY,

ABSTRACT:

THE RELATIONAL MODEL HAS RECEIVED INCREASING ATTENTION DURING THE PAST DECADE. ITS ADVANTAGES INCLUDE SIMPLICITY, CONSISTENCY, AND A SOUND THEORETICAL BASIS. IN THIS ARTICLE, THE NATURALNESS OF VIEWING INFORMATION RETRIEVAL RELATIONALLY IS DEMONSTRATED. THE RELATIONAL MODEL IS PRESENTED, AND THE RELATIONAL ORGANIZATION OF A BIBLIOGRAPHICAL DATABASE IS SHOWN. THE NOTION OF NORMALIZATION IS INTRODUCED AND FIRST, SECOND, THIRD, AND FOURTH NORMAL FORMS ARE DEMONSTRATED. RELATIONAL LANGUAGES ARE DISCUSSED, INCLUDING THE RELATIONAL CALCULUS, RELATIONAL

ALGEBRA, AND SEQUEL. NUMEROUS EXAMPLES PERTINENT TO INFORMATION RETRIEVAL ARE PRESENTED IN THESE RELATIONAL LANGUAGES. ADVANTAGES OF THE RELATIONAL APPROACH TO INFORMATION RETRIEVAL ARE NOTED.

KEYWORDS:

INFORMATION RETRIEVAL * RELATIONAL MODEL * DATA BASE *
NORMALIZATION * NORMAL FORMS * RELATION LANGUAGE

CATEGORIES:

3.70 * 4.2 * 4.33 * 5.41

REFERENCE CODE: 113

JOURNAL:

JASIS

VOLUME: 32

ISSUE: 5

DATE: SEPTEMBER 1981

PAGES: 325 - 333

TITLE:

A STATE TRANSITION ANALYSIS OF ONLINE INFORMATION-SEEKING
BEHAVIOR

AUTHOR(s):

CHAPMAN, JANET L.

AFFILIATION:

SCHOOL OF LIBRARY AND INFORMATION SCIENCE, DREXEL
UNIVERSITY, PHILADELPHIA

ABSTRACT:

STATISTICAL ANALYSES OF ONLINE SEARCHING PATTERNS COMPARED THE USAGE OF A QUERY LANGUAGE BY VARIOUS GROUPS OF SEARCHERS. DATA WERE GATHERED BY AN EXPERIMENTAL PROJECT, INDIVIDUALIZED INSTRUCTION FOR DATA ACCESS (IIDA), CONCERNED WITH DEVELOPING AND TESTING A SYSTEM WHICH SERVES AS A TEACHER AND ASSISTANT TO USERS OF LOCKHEED'S DIALOG SYSTEM. SEQUENTIAL LISTINGS OF USER COMMANDS WERE CLASSIFIED BY CORRESPONDING STATE CODES TO REPRESENT PHASES OF SEARCHING. ZERO-THROUGH FOURTH-ORDER MARKOVIAN ANALYSES OF INDIVIDUAL COMMANDS AND STRINGS OF LIKE COMMANDS WERE PERFORMED TO COMPARE SEARCHING PROCEDURES USED BY THREE CLASSES OF USERS. CLASS 1 COMPARED NOVICES DIFFERING IN THEIR USE OF IIDA AS AN ADJUNCT TRAINER; CLASS 2 COMPARED INEXPERIENCED, IIDA-TRAINED SEARCHERS WITH PROFESSIONAL SEARCHERS; CLASS 3 COMPARED INEXPERIENCED SEARCHERS TAUGHT BY EITHER IIDA OR PROFESSIONAL SEARCHERS. ANALYSIS REVEALED THAT SEARCHERS TEND TO FOLLOW THE ADVICE OF THEIR TRAINER, WHETHER IT BE HUMAN OR COMPUTER. THE USE OF IIDA AS THE SOLE TRAINING

METHOD APPEARS TO PRODUCE SEARCHERS WHO USE SIMILAR PATTERNS OF SEARCHING. THE USE OF ANOTHER TRAINING METHOD IN ADDITION TO OR INSTEAD OF IIDA APPEARS TO PRODUCE SEARCHERS WITH VARIED AND INDIVIDUAL "STYLES" OF ONLINE SEARCHING.

KEYWORDS:

ONLINE SYSTEM * SEARCHING * QUERY LANGUAGE * DATA BASE *
DATA ACCESS * TRAINING METHOD * MARKOVIAN ANALYSES

CATEGORIES:

3.74 * 4.22 * 4.33

REFERENCE CODE: 114

JOURNAL:

JASIS

VOLUME: 33

ISSUE: 5

DATE: SEPTEMBER 1982

PAGES: 325 - 332

TITLE:

A COMPUTER INTERMEDIARY FOR INTERACTIVE DATABASE SEARCHING.
I. DESIGN

AUTHOR(s):

MEADOW, CHARLES T. * HEWETT, THOMAS T. * AVERSA, ELIZABETH S.

AFFILIATION:

DREXEL UNIVERSITY, PHILADELPHIA

ABSTRACT:

THIS IS THE FIRST OF TWO ARTICLES THAT REPORT ON THE DEVELOPMENT, TESTING, AND EVALUATION OF THE INDIVIDUALIZED INSTRUCTION FOR DATA ACCESS SYSTEM (IIDA). IIDA IS AN EXAMPLE OF A CLASS OF COMPUTER SYSTEMS WHICH SERVE AS INTERMEDIARIES, ENABLING THEIR USERS TO PERFORM A COMPLEX TASK ON ANOTHER COMPUTER, AND WHICH ARE COMING TO BE KNOWN AS EXPERT SYSTEMS. THE SYSTEM WAS DESIGNED TO ENCOURAGE END USERS OF INFORMATION RETRIEVAL SYSTEMS TO PERFORM THEIR OWN SEARCHES BY (1) INSTRUCTING THEM IN HOW TO SEARCH, USING COMPUTER-ASSISTED INSTRUCTION, AND (2) ASSISTING WITH THE PERFORMANCE OF THE SEARCH BY PROVIDING DIAGNOSTIC ANALYSES OF THE USER'S PERFORMANCE AS WELL AS ANSWERING THEIR QUESTIONS ABOUT HOW TO USE SYSTEM COMMANDS. THE SYSTEM'S DESIGN IS DESCRIBED, AS WELL AS THE VARIOUS TESTS OF ITS PERFORMANCE AND THE EVALUATION OF TEST RESULTS. THE CONCLUSION IS DRAWN THAT END USERS CAN BECOME SUCCESSFUL SEARCHERS THROUGH SUCH AN ASSISTANT, FOR THE KINDS OF SEARCHES TESTED.

KEYWORDS:

SEARCHING * DATA BASE * INTERACTIVE * SYSTEM EVALUATION *
INFORMATION RETRIEVAL * INSTRUCTION

CATEGORIES:

3.70 * 3.72 * 3.74 * 4.33

REFERENCE CODE: 115

JOURNAL:

JASIS

VOLUME: 33

ISSUE: 6

DATE: NOVEMBER 1982

PAGES: 357 - 364

TITLE:

A COMPUTER INTERMEDIARY FOR INTERACTIVE DATABASE SEARCHING.
II. EVALUATION

AUTHOR(s):

MEADOW, CHARLES T. * HEWETT, THOMAS T. * AVERSA, ELIZABETH S.

AFFILIATION:

DREXEL UNIVERSITY, PHILADELPHIA

ABSTRACT:

THIS IS THE SECOND OF TWO ARTICLES DESCRIBING THE DEVELOPMENT, TESTING, AND EVALUATION OF THE INDIVIDUALIZED INSTRUCTION FOR DATA BASE ACCESS SYSTEM (IIDA). THE SYSTEM WAS TESTED IN AN INDUSTRIAL SETTING AND IT WAS DEMONSTRATED THAT (1) END USERS OF SCIENTIFIC AND TECHNICAL LITERATURE COULD LEARN TO DO THEIR OWN BIBLIOGRAPHIC SEARCHES THROUGH COMPUTER-ASSISTED INSTRUCTION AS WELL AS THEY LEARNED THROUGH A COMPARABLE PERIOD OF CONVENTIONAL INSTRUCTION, AND (2) END USERS WERE AS SATISFIED WITH THE RESULTS OF THEIR OWN SEARCHINGS AS WITH THE RESULT OF SEARCHES PERFORMED FOR THEM, FOR THE TYPES OF SEARCHES TESTED.

KEYWORDS:

SEARCHING * DATA BASE * INTERACTIVE * SCIENTIFIC END USERS *
TECHNICAL LITERATURE

CATEGORIES:

3.74 * 4.33

REFERENCE CODE: 116

JOURNAL:

JASIS
VOLUME: 33
ISSUE: 6
DATE: NOVEMBER 1982
PAGES: 375 - 382

TITLE:
THE SYSTEMS MOVEMENT: AN OVERVIEW FOR INFORMATION SCIENTISTS

AUTHOR(s):
MANSFIELD, UNA

AFFILIATION:
DEPARTMENT OF ECONOMICS, PRINCETON UNIVERSITY, PRINCETON

ABSTRACT:
THE FOCUS OF INFORMATION RESEARCH IN ANY GIVEN DISCIPLINE DEPENDS ON THE MEANING OF THE WORD "INFORMATION" FOR SCIENTISTS IN THAT DISCIPLINE. THIS ARTICLE LISTS SOME OF THE "DISCIPLINES OF INFORMATION", INCLUDING SEVERAL WITH A STRONG SYSTEMS ORIENTATION, AND IDENTIFIES THOSE INFORMATION SCIENTISTS FOR WHOM A KNOWLEDGE OF SYSTEM METHODOLOGY IS IMPORTANT. THIS IS FOLLOWED BY A BROADBRUSH TREATMENT OF THE MODERN SYSTEMS MOVEMENT: ITS ROLE IN THE CHANGING WORLDVIEW OF SCIENCE, SOME DISCIPLINES (EG., CYBERNETICS AND OPERATIONS RESEARCH) THAT HAVE CONTRIBUTED TO ITS DEVELOPMENT, AND THE DISTINCTION THAT CAN BE DRAWN BETWEEN GENERAL SYSTEMS THEORY (GST) AND OTHER APPROACHES TO THE STUDY OF SYSTEMS --- A THEME DEVELOPED BY MATTESSICH IN THE ARTICLE THAT FOLLOWS.

KEYWORDS:
SYSTEM MOVEMENT * INFORMATION SCIENCE * SYSTEM METHODOLOGY *
SYSTEM THEORY * SYSTEM ORIENTATION

CATEGORIES:
5.6

REFERENCE CODE: 117

JOURNAL:
JASIS
VOLUME: 34
ISSUE: 1
DATE: JANUARY 1983
PAGES: 31 - 39

TITLE:
EXPLOITING THE MAXIMUM ENTROPY PRINCIPLE TO INCREASE
RETRIEVAL EFFECTIVENESS

AUTHOR(s):
COOPER, WILLIAM S.

AFFILIATION:
SCHOOL OF LIBRARY AND INFORMATION STUDIES, UNIVERSITY OF
CALIFORNIA, BERKELEY

ABSTRACT:
SEVERAL OF THE DRAWBACKS OF CONVENTIONAL INFORMATION
RETRIEVAL SYSTEMS CAN BE OVERCOME BY A DESIGN APPROACH IN
WHICH QUERIES CONSIST OF SETS OF TERMS, EITHER UNWEIGHTED OR
WEIGHTED WITH SUBJECTIVE TERM PRECISION ESTIMATES, AND
RETRIEVAL OUTPUTS ARE RANKED BY PROBABILITY OF USEFULNESS
ESTIMATED IN ACCORDANCE WITH THE SO-CALLED "MAXIMUM ENTROPY
PRINCIPLE". A SYSTEM ORGANIZED ALONG THESE LINES COMBINES
THE CONVENIENCE OF A SIMPLE INPUT LANGUAGE WITH A POWERFUL
PROBABILISTIC INFERENCE MECHANISM CAPABLE OF EXPLOITING
KINDS OF STATISTICAL CLUES NOT ORDINARILY USED IN SYSTEMS OF
TRADITIONAL DESIGN. THE SENSITIVITY OF THE MAXIMUM ENTROPY
PRINCIPLE TO THE FREQUENCIES AND JOINT FREQUENCIES WITH
WHICH TERMS HAVE BEEN ASSIGNED TO DOCUMENTS IN THE
COLLECTION RESULTS IN A SYSTEM DESIGN OF INCREASED POWER AND
EXPRESSIVENESS WITHOUT A CONCOMITANT INCREASE IN THE
COMPLEXITY OF THE REQUEST LANGUAGE. IT INCORPORATES THE MORE
IMPORTANT SEARCH CAPABILITIES OF BOTH BOOLEAN AND
CONVENTIONAL WEIGHTED-REQUEST LANGUAGES AND FACILITATES THE
USE OF UNCONVENTIONAL SEARCH CLUES.

KEYWORDS:
INFORMATION RETRIEVAL * DESIGN * QUERY * PROBABILITY *
STATISTICAL * FREQUENCY * SEARCHING * LANGUAGE

CATEGORIES:
3.7 * 3.74 * 5.5 * 7.2

REFERENCE CODE: 118

JOURNAL:
JASIS
VOLUME: 35
ISSUE: 1
DATE: JANUARY 1984
PAGES: 3 - 10

TITLE:
STATISTICAL RECOGNITION OF CONTENT TERMS IN GENERAL TEXT

AUTHOR(s):
DILLON, MARTIN * FEDERHART, PEGGY

AFFILIATION:

SCHOOL OF LIBRARY SCIENCE, UNIVERSITY OF NORTH CAROLINA *
LIBRARY, IBM CORPORATION, CHARLOTTE

ABSTRACT:

THIS ARTICLE DISCUSSES WAYS TO IMPROVE THE QUALITY OF RETRIEVAL SYSTEMS THAT DEPEND ON THE USE OF TRUNCATED WORDS OR QUASI-WORD STEMS AS AN INDEXING VOCABULARY. THE PROBLEMS ADDRESSED ARE THE GENERALIZABILITY AND STABILITY OF DISCRIMINATE FUNCTION ANALYSIS FOR SELECTING GOOD TOPICAL TERMS FROM ABSTRACTS OF HARRIS SURVEY PRESS RELEASES. RESULTS CONFIRM THAT TOPICAL TERMS CAN BE IDENTIFIED BY THEIR STATISTICAL PROPERTIES. CONSISTENTLY HIGH RECALL OF TOPICAL TERMS UNDER A VARIETY OF DIFFERENT CONDITIONS IMPLIES PERSISTENT UNDERLYING PROPERTIES STRONG ENOUGH TO RESIST CHANGES IN TEST ENVIRONMENT.

KEYWORDS:

STATISTICAL * INFORMATION RETRIEVAL * VOCABULARY *
DISCRIMINANT FUNCTION * TOPICAL TERM

CATEGORIES:

3.7 * 3.75 * 5.5

REFERENCE CODE: 119

JOURNAL:

JASIS

VOLUME: 35

ISSUE: 1

DATE: JANUARY 1984

PAGES: 19 - 28

TITLE:

LESS THAN FULL-TEXT INDEXING USING A NON-BOOLEAN SEARCHING
MODEL

AUTHOR(s):

CLEVELAND, DONALD B. * CLEVELAND, ANA D. * WISE, OLGA B.

AFFILIATION:

SCHOOL OF LIBRARY AND INFORMATION SCIENCES, NORTH TEXAS
STATE UNIVERSITY * TEXAS, WOMAN'S UNIVERSITY, DENTON *
TEXAS, WOMAN'S UNIVERSITY, DENTON

ABSTRACT:

THE RELATIVE EFFECTIVENESS OF INDEXING USING FULL-TEXT OR LESS THAN FULL-TEXT WAS TESTED USING A NON-BOOLEAN, CHAINING TYPE OF FILE STRUCTURE AND SEARCHING METHOD. INDEXING WAS DONE USING TITLES, ABSTRACTS, FULL-TEXT, REFERENCES, AND VARIOUS COMBINATIONS OF THESE SURROGATES AND THEN GOFFMAN'S INDIRECT METHOD OF INFORMATION RETRIEVAL WAS USED TO

STRUCTURE AND SEARCH THE FILE. THE DATABASE CONSISTED OF 733 DOCUMENTS AND 38 QUERIES WERE SEARCHED. THE HYPOTHESIS OF THE STUDY AS A FILE STRUCTURING AND SEARCHING TECHNIQUE, FULL-TEXT INDEXING IS NOT ESSENTIAL TO OPTIMUM INFORMATION RETRIEVAL EFFECTIVENESS. THE OUTCOME OF THE STUDY WAS POSITIVE.

KEYWORDS:

SEARCHING * NON-BOOLEAN * FILE STRUCTURE * INDEXING * DATA
STRUCTURE * INFORMATION RETRIEVAL * HYPOTHESIS

CATEGORIES:

3.7 * 3.74 * 4.34

REFERENCE CODE: 120

JOURNAL:

PERFORMANCE EVALUATION REVIEW

VOLUME: 7

DATE: APRIL 1978

PAGES: 6 - 14

TITLE:

HUMAN PERFORMANCE EVALUATION IN THE USE OF FEDERAL COMPUTER
SYSTEMS: RECOMMENDATIONS

AUTHOR(s):

UNDERWOOD, MARK A.

AFFILIATION:

NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER

ABSTRACT:

THERE HAS BEEN INCREASED AWARENESS IN RECENT YEARS OF THE HIGH COST OF NON-HARDWARE ITEMS IN THE FEDERAL ADP BUDGET IN CONTRAST WITH DECREASING COSTS FOR MUCH OF THE HARDWARE. MORE ATTENTION IS BEING GIVEN TO SOFTWARE DEVELOPMENT COSTS, SYSTEMS DESIGN PRACTICES, AUTOMATIC PROGRAM TESTING, AND THE LIKE. PARTICULAR COMMERCIAL AND MILITARY SYSTEMS EFFECTIVENESS AND LIFE CYCLE COSTS NOW TAKE INTO CONSIDERATION SUCH FACTORS AS PART OF THE PLANNING PROCESS. IT IS SUGGESTED THAT NOT ENOUGH ATTENTION HAS BEEN GIVEN TO MEASUREMENT OF HUMAN PERFORMANCE VARIABLES AS PART OF THE SYSTEMS PROCUREMENT AND SYSTEMS EVALUATION PHASES OF FEDERAL ADP PROGRAMS. RECOMMENDATIONS ARE MADE FOR THE INCORPORATION OF SUCH MEASURES ALONG WITH CONVENTIONAL HARDWARE/SOFTWARE PERFORMANCE MEASUREMENT.

KEYWORDS:

COMPUTER PERFORMANCE * FEDERAL SYSTEMS EVALUATIONS * HUMAN
PERFORMANCE MEASUREMENTS * PSYCHOLOGY OF COMPUTER SYSTEMS

USAGE

CATEGORIES:

2.0 * 4.6

REFERENCE CODE: 121

JOURNAL:

PERFORMANCE EVALUATION REVIEW

VOLUME: 8

ISSUE: 4

DATE: DECEMBER 1979

PAGES: 24 - 36

TITLE:

SIMULATING WORKING SETS UNDER MVS

AUTHOR(s):

PETRELLA, ARTHUR * FARREY, HAROLD

AFFILIATION:

INA CORPORATE PROCESSING CENTER

ABSTRACT:

THE CONCEPT OF "WORKING-SET" OF A PROGRAM RUNNING IN A VIRTUAL MEMORY ENVIRONMENT IS NOW SO FAMILIAR THAT MANY OF US FAIL TO REALIZE JUST HOW LITTLE WE REALLY KNOW ABOUT WHAT IT IS, WHAT IT MEANS, AND WHAT CAN BE DONE TO MAKE SUCH KNOWLEDGE ACTUALLY USEFUL. THIS FOLLOWS, PERHAPS, FROM THE ABSTRACT AND APPARENTLY INTANGIBLE FACADE THAT TENDS TO OBSCURE THE MEANING OF WORKING SET. WHAT WE CANNOT MEASURE OFTEN RANKS HIGH IN CURIOSITY VALUE, BUT RANKS LOW IN PRAGMATIC UTILITY. WHERE WE HAVE MEASURES, AS IN THE PAGE-SECONDS OF SMF/MVS, THE SITUATION BECOMES EVEN MORE CURIOUS: HERE A SINGLE NUMBER PURPORTS TO TELL US CONCURRENT PROGRAMS, AND MAYBE SOMETHING ABOUT THE WORKING SETS OF OTHER CONCURRENT PROGRAMS, BUT NOT VERY MUCH ABOUT EITHER. THIS PAPER DESCRIBES A CASE IN WHICH THE CONCEPT OF THE ELUSIVE WORKING SET HAS BEEN ENCOUNTERED IN PRACTICE, HAS BEEN INTENSIVELY ANALYZED, AND FINALLY, HAS BEEN CONFRONTED IN ITS OWN REALM. IT HAS BEEN TRAPPED, WRAPPED, AND, AT LAST, FORCED TO REVEAL ITSELF FOR WHAT IT REALLY IS. IT IS NOT A NUMBER! YET IT CAN BE MEASURED. AND WHAT IT IS, TOGETHER WITH ITS MEASURES, TURNS OUT TO BE SOMETHING NOT ONLY HIGH IN CURIOSITY VALUE, BUT ALSO SOMETHING VERY USEFUL AS A MEANS TO PREDICT THE PAGE FAULTING BEHAVIOR OF A PROGRAM RUNNING IN A RELATIVELY COMPLEX MULTI- PROGRAMMED ENVIRONMENT. THE INFORMATION PRESENTED HERE RELATES TO EXPERIENCE GAINED DURING THE CONVERSION OF A DISCRETE EVENT SIMULATION MODEL TO A HYBRID MODEL WHICH EMPLOYS ANALYTICAL TECHNIQUES TO FORECAST THE DURATION OF "STEADY- STATE"

INTERVALS BETWEEN MIX-CHANGE EVENTS IN THE SIMULATION OF A NETWORK- SCHEDULED JOB STREAM PROCESSING ON A 370/168-3AP UNDER MVS. THE SPECIFIC "ENCOUNTER" WITH THE CONCEPT OF WORKING SETS CAME ABOUT WHEN AN ANALYTICAL TREATMENT OF PROGRAM PAGING WAS INCORPORATED INTO THE MODEL. AS A RESULT OF CONSIDERABLE LUCK, INGENUITY, AND BRUTE-FORCE EMPIRICISM, THE MODEL WON. SEVERAL EXAMPLES OF EMPIRICALLY DERIVED CHARACTERISTIC WORKING SET FUNCTIONS, TOGETHER WITH TYPICAL MODEL RESULTS, ARE SUPPORTED WITH A DISCUSSION OF RELEVANT MODELING TECHNIQUES AND AREAS OF APPLICATION.

KEYWORDS:

SIMULATION EVALUATION * PRAGMATIC UTILITY * WORKING SET * CONCURRENT PROGRAM * MEASURE * ANALYTICAL TECHNIQUES * MODEL

CATEGORIES:

2.0 * 4.6 * 6.29 * 7.1 * 8.1

REFERENCE CODE: 122

JOURNAL:

PERFORMANCE EVALUATION REVIEW

VOLUME: 9

ISSUE: 1

DATE: MARCH 1980

PAGES: 59 - 68

TITLE:

MEASUREMENT OF COMPUTER COMPUTER USER SATISFACTION

AUTHOR(s):

PEARSON, SAMMY W. * BAILEY, JAMES E.

AFFILIATION:

FEDERAL COMPUTER PERFORMANCE EVALUATION AND SIMULATION CENTER (FEDSIM) * ARIZONA STATE UNIVERSITY

ABSTRACT:

THIS PAPER PRESENTS THE DEVELOPMENT AND EVALUATION OF A QUESTIONNAIRE DESIGNED TO QUANTITATIVELY MEASURE COMPUTER USER SATISFACTION. THE ADMINISTRATION, SCORING, AND INTERPRETATION OF THE QUESTIONNAIRE ARE ALSO ADDRESSED.

KEYWORDS:

MEASUREMENT * EVALUATION * SATISFACTION * ADMINISTRATION

CATEGORIES:

2.4 * 2.49

REFERENCE CODE: 123

JOURNAL:
PERFORMANCE EVALUATION REVIEW
VOLUME: 9
ISSUE: 3
DATE: SEPTEMBER 1980
PAGES: 31 - 36

TITLE:
EMPIRICAL INVESTIGATION OF THE EFFECTIVENESS OF SEVERAL
COMPUTER PERFORMANCE EVALUATION TOOLS

AUTHOR(s):
CLARK, JON D. * GOLLADAY, ROBERT M.

AFFILIATION:
DEPARTMENT OF ACCOUNTING AND INFORMATION SYSTEMS, NORTH
TEXAS STATE UNIVERSITY

ABSTRACT:
A NUMBER OF TOOLS EXIST FOR COMPUTER SELECTION EVALUATION.
THE OPERATIONAL COST OF APPLYING THESE VARY CONSIDERABLY AS
DOES THE PRECISION OF THE PERFORMANCE PREDICTION. THIS PAPER
COMPARES THE PRECISION OF SEVERAL COMMONLY USED METHODS IN A
SINGLE TEST CASE, NAMELY CYCLE TIME, INSTRUCTION MIX
ANALYSIS AND BENCHMARKING.

KEYWORDS:
COMPUTER * PERFORMANCE EVALUATION * CYCLE TIME * INSTRUCTION
MIX * BENCHMARK

CATEGORIES:
2.12 * 2.9 * 3.89

REFERENCE CODE: 124

JOURNAL:
PERFORMANCE EVALUATION REVIEW
VOLUME: 9
ISSUE: 4
DATE: DECEMBER 1980
PAGES: 11 - 25

TITLE:
ADP CAPACITY PLANNING: A CASE STUDY

AUTHOR(s):
YADER, MARK J.

AFFILIATION:

NETWORK ANALYSIS CORPORATION

ABSTRACT:

A CASE STUDY OF SHORT-RANGE ADP CAPACITY PLANNING IS PRESENTED AND RELATED TO THE PROCESS OF LONG-RANGE PLANNING. SHORT-RANGE CAPACITY PLANNING IS CONCERNED WITH IDENTIFICATION OF COMPUTER AND COMMUNICATION RESOURCES WHICH WILL REACH SATURATION LEVELS IN THE NEAR FUTURE. THE INITIAL STEP IN THE SHORT-RANGE PLANNING PROCESS IS TO EVALUATE THE PERFORMANCE OF THE USER'S CURRENT SYSTEM CONFIGURATION AND ONE OR MORE CONFIGURATION ENHANCEMENTS WITH RESPECT TO THEIR EFFECTIVENESS IN SUPPORTING A PROJECTED WORKLOAD. CENTRAL TO LONG-RANGE PLANNING IS THE EVALUATION OF A BROADER RANGE OF ARCHITECTURAL ALTERNATIVES, INCLUDING VARIOUS DISTRIBUTED PROCESSING DESIGNS. IN BOTH SHORT RANGE AND LONG RANGE PLANNING, SYSTEM MODELING IS A BASIC TOOL FOR EVALUATING ALTERNATIVES. AN ANALYTIC NETWORK OF QUEUES MODEL HAS BEEN DEVELOPED TO REFLECT BOTH CENTRALIZED AND HIERARCHICALLY DISTRIBUTED NETWORK ARCHITECTURES. THE APPLICATION OF THE TOOL AS PART OF THE SHORT-RANGE CASE STUDY IS DESCRIBED.

KEYWORDS:

ADP CAPACITY PLANNING * SHORT-RANGE * LONG-RANGE *
PERFORMANCE EVALUATION * SYSTEM MODELING * NETWORK
ARCHITECTURE

CATEGORIES:

3.50 * 3.59 * 6.0

REFERENCE CODE: 125

JOURNAL:

PERFORMANCE EVALUATION REVIEW

VOLUME: 10

ISSUE: 4

DATE: DECEMBER 1981

PAGES: 57 - 73

TITLE:

AN APPROACH TO INTERACTIVE PERFORMANCE ANALYSIS IN A BUSY
PRODUCTION SYSTEM (NOS/BE)

AUTHOR(s):

NEMETH, THOMAS A.

AFFILIATION:

UNIVERSITY OF ADELAIDE

ABSTRACT:

MANY DIFFERENT IDEAS HAVE BEEN PROMULGATED ON PERFORMANCE
EVALUATION BY SOFTWARE AND HARDWARE MONITORING OR MODELING,

BUT MOST OF THESE HAVE ASSOCIATED IMPLEMENTATION PROBLEMS IN PRACTICE. BY ADOPTING A SLIGHTLY DIFFERENT APPROACH, (USING AN APPROXIMATION TO "SERVICE WAIT TIME"), AN ANALYSIS OF RESPONSE IS POSSIBLE IN A PRODUCTION SYSTEM, WITH NEGLIGIBLE OVERHEAD. THIS ANALYSIS ALLOWS THE ACTUAL AREAS OF CONTENTION TO BE IDENTIFIED, AND SOME RATHER UNEXPECTED RESULTS EMERGE, WITH A DIRECT APPLICATION TO SCHEDULING POLICY. THE WORK WAS DONE USING THE NOS/BE OPERATING SYSTEM ON A CDC CYBER 173 AT THE UNIVERSITY OF ADELAIDE.

KEYWORDS:

PERFORMANCE EVALUATION * RESPONSE * MEASUREMENT *
MULTIPROGRAMMING * SCHEDULING * PRODUCTION * TIMESHARING

CATEGORIES:

2.44 * 3.80 * 4.32 * 4.35 * 8.3

REFERENCE CODE: 126

JOURNAL:

PERFORMANCE EVALUATION REVIEW

VOLUME: 10

ISSUE: 4

DATE: DECEMBER 1981

PAGES: 74 - 80

TITLE:

A COMPUTER PERFORMANCE EVALUATION

AUTHOR(s):

KNUDSON, MICHAEL E.

AFFILIATION:

GOULD, INC. S.E.L. COMPUTER SYSTEMS DIVISION

ABSTRACT:

A METHOD SUGGESTING HOW TO ORGANIZE AND OPERATE A COMPUTER PERFORMANCE AND EVALUATION (CPE) PROJECT IS PRESENTED. IT SHOULD BE NOTED THAT THE SUGGESTED PRINCIPLES COULD APPLY TO A MODELING OR SIMULATION EFFORT.

KEYWORDS:

PERFORMANCE EVALUATION * MODELING * SIMULATION

CATEGORIES:

8.1

REFERENCE CODE: 127

JOURNAL:
PERFORMANCE EVALUATION REVIEW
VOLUME: 11
ISSUE: 3
DATE: SEPTEMBER 1982
PAGES: 15 - 20

TITLE:
DATA, DEFINITION, DEDUCTION: AN EMPIRICAL VIEW OF
OPERATIONAL ANALYSIS

AUTHOR(s):
COX, SPRINGER

AFFILIATION:
DIGITAL EQUIPMENT CORPORATION

ABSTRACT:
THE THEORETICAL ASPECTS OF OPERATIONAL ANALYSIS HAVE BEEN
CONSIDERED MORE EXTENSIVELY THAN MATTERS OF ITS APPLICATION
IN PRACTICAL SITUATIONS. SINCE ITS RELATIONSHIPS DIFFER IN
THEIR APPLICABILITY, THEY MUST BE CONSIDERED SEPARATELY WHEN
THEY ARE APPLIED. IN ORDER TO DO THIS, THE FOUNDATIONS OF
THREE SUCH RELATIONSHIPS ARE EXAMINED FROM AN EMPIRICAL
POINT OF VIEW. TO FURTHER DEMONSTRATE THE INTIMATE
CONNECTION BETWEEN DATA, DEFINITIONS, AND PERFORMANCE
MODELS, THE PROBLEM OF MEASUREMENT IS CONSIDERED.

KEYWORDS:
DATA * DEFINITION * INFORMATION THEORY * EMPIRICAL *
PERFORMANCE MODEL

CATEGORIES:
5.0 * 5.6

REFERENCE CODE: 128

JOURNAL:
PERFORMANCE EVALUATION REVIEW
VOLUME: 11
ISSUE: 3
DATE: SEPTEMBER 1982
PAGES: 48 - 72

TITLE:
FOUNDATIONS AND EXPERIMENTS IN SOFTWARE SCIENCE

AUTHOR(s):
BESER, NICHOLAS

AFFILIATION:

GENERAL ELECTRIC COMPANY, SPACE DIVISION, VALLEY FORGE SPACE CENTER

ABSTRACT:

A NUMBER OF PAPERS HAVE APPEARED ON THE SUBJECT OF SOFTWARE SCIENCE; CLAIMING THE EXISTENCE OF LAWS RELATING THE SIZE OF A PROGRAM AND THE NUMBER OF OPERANDS AND OPERATORS USED. THE PRE-EMINENT THEORY WAS DEVELOPED BY HALSTEAD IN 1972. THE THESIS WORK FOCUSES ON THE EXAMINATION OF HALSTEAD'S THEORY; WITH AN EMPHASIS ON HIS FUNDAMENTAL ASSUMPTIONS. IN PARTICULAR, THE LENGTH ESTIMATOR WAS ANALYZED TO DETERMINE WHY IT YIELDS SUCH A HIGH VARIANCE; THE THEORETICAL FOUNDATIONS OF SOFTWARE SCIENCE HAVE BEEN EXTENDED TO IMPROVE THE APPLICABILITY OF THE CRITICAL LENGTH ESTIMATOR. THIS ELABORATION OF THE BASIC THEORY WILL RESULT IN GUIDELINES FOR THE CREATION OF COUNTING RULES APPLICABLE TO SPECIFIC CLASSES OF PROGRAMS, SO THAT IT IS POSSIBLE TO DETERMINE BOTH WHEN AND HOW SOFTWARE SCIENCE CAN BE APPLIED IN PRACTICE.

KEYWORDS:

SOFTWARE * FUNDAMENTAL ASSUMPTION * LENGTH ESTIMATOR * COUNTING RULE

CATEGORIES:

4.0 * 4.6

REFERENCE CODE: 129

JOURNAL:

PERFORMANCE EVALUATION REVIEW

VOLUME: 11

ISSUE: 3

DATE: SEPTEMBER 1982

PAGES: 73 - 74

TITLE:

PRODUCT ASSURANCE PROGRAM ANALYZER (P.A.P.A.) A TOOL FOR PROGRAM COMPLEXITY EVALUATION

AUTHOR(s):

SCHNURER, KARL ERNST

AFFILIATION:

IBM GERMANY - BOEBLINGEN LAB.

ABSTRACT:

THIS TOOL HAS BEEN DEVELOPED TO ASSIST IN THE SOFTWARE VALIDATION PROCESS. P.A.P.A. WILL MEASURE THE COMPLEXITY OF PROGRAMS AND DETECT SEVERAL PROGRAM ANOMALIES. THE RESULTING LIST OF ANALYZED PROGRAMS IS SORTED IN ORDER OF DESCENDING

COMPLEXITY. SINCE HIGH COMPLEXITY AND ERROR-PRONENESS ARE STRONGLY RELATED, THE "CRITICAL" PROGRAMS WILL BE FOUND EARLIER WITHIN THE DEVELOPMENT CYCLE. P.A.P.A. PROVIDES SYNTAX ANALYZERS FOR RPG(II/III), PSEUDO CODE (DESIGN AND DOCUMENTATION LANGUAGE) AND PL/SIII (WITHOUT MACRO LANGUAGE). IT MAY BE APPLIED DURING THE DESIGN-, CODING- AND TESTPHASE OF SOFTWARE DEVELOPMENT (E.G. FOR DESIGN- AND CODE INSPECTIONS).

KEYWORDS:

SOFTWARE VALIDATION * ANALYZED PROGRAM * PSEUDO CODE * DEVELOPMENT CYCLE

CATEGORIES:

4.0

REFERENCE CODE: 130

JOURNAL:

PERFORMANCE EVALUATION REVIEW

VOLUME: 11

ISSUE: 3

DATE: SEPTEMBER 1982

PAGES: 101 - 128

TITLE:

AN APPLICATION OF SOFTWARE SCIENCE TO THE QUANTITATIVE MEASUREMENT OF CODE QUALITY

AUTHOR(s):

NAIB, FARID A.

AFFILIATION:

INFORMATION SYSTEMS GROUP, IBM CORPORATION

ABSTRACT:

THE ERROR RATE OF A SOFTWARE APPLICATION MAY FUNCTION AS A MEASUREMENT OF CODE QUALITY. A METHODOLOGY HAS BEEN DEVELOPED WHICH ALLOWS FOR THE ACCURATE PREDICTION OF THE ERROR RATE AND HENCE CODE QUALITY PRIOR TO AN APPLICATION'S RELEASE. MANY FACTORS WERE CONSIDERED WHICH COULD CONCEIVABLY BE RELATED TO THE ERROR RATE. THESE FACTORS WERE DIVIDED INTO TWO CATEGORIES: THOSE FACTORS WHICH VARY WITH TIME, AND THOSE FACTORS WHICH DO NOT VARY WITH TIME. FACTORS WHICH VARY WITH TIME WERE TERMED ENVIRONMENTAL FACTORS AND INCLUDED SUCH ITEMS AS: NUMBER OF USERS, ERRORS SUBMITTED TO DATE, ETC. FACTORS WHICH DO NOT VARY WITH TIME WERE TERMED INTERNAL FACTORS AND INCLUDED HALSTEAD METRICS, McCABE METRICS AND LINES OF CODE. BECAUSE THE ERROR RATE OF A SOFTWARE PACKAGE FLUCTUATES GREATLY WITH TIME, ENVIRONMENTAL FACTORS RATHER THAN INTERNAL FACTORS WERE FIRST STUDIED. A

COMBINATION OF ENVIRONMENTAL FACTORS WERE FOUND TO BE HIGHLY CORRELATED TO THE FLUCTUATIONS OF THE ERROR RATE. WITH HISTORICAL DATA, REGRESSION ANALYSIS MAY BE RUN TO DETERMINE THE COEFFICIENTS FOR EACH ENVIRONMENTAL FACTOR. THE COEFFICIENT MAY BE THOUGHT OF AS A MEASURE OF THE EFFECT EACH ENVIRONMENTAL FACTORS HAS ON THE ERROR RATE. EVERY APPLICATION HAS ITS OWN UNIQUE COEFFICIENT FOR EACH ENVIRONMENTAL FACTOR. THESE COEFFICIENTS ARE CONSTANT THROUGHOUT THE PERIOD STUDIED. SOFTWARE SCIENCE MEASURES WERE GENERATED FOR EACH APPLICATION. THESE MEASURES WERE THEN STUDIED TO DETERMINE ANY RELATIONSHIPS BETWEEN AN APPLICATION'S COEFFICIENT AND ITS SOFTWARE SCIENCE METRICS. THE DIFFERENCES IN CERTAIN OF THE APPLICATIONS METRICS WERE FOUND TO BE HIGHLY CORRELATED TO THE DIFFERENCES IN THE APPLICATIONS COEFFICIENT'S. BY UTILIZING THE METHODOLOGY OUTLINED IN THIS PAPER, IT IS POSSIBLE TO ACCURATELY ESTIMATE THE ERROR RATE OF A SOFTWARE PACKAGE PRIOR TO ITS RELEASE THROUGH THE UTILIZATION OF SOFTWARE SCIENCE METRICS.

KEYWORDS:

SOFTWARE SCIENCE * CODE QUALITY * MEASUREMENT * TIME * ENVIRONMENT FACTOR * INTERNAL FACTOR * ERROR RATE

CATEGORIES:

4.0

REFERENCE CODE: 131

JOURNAL:

ACM/SIGMETRICS CONFERENCE ON MEASUREMENT AND MODELING OF COMPUTER SYSTEMS PERFORMANCE EVALUATION REVIEW

VOLUME: 10

ISSUE: 3

DATE: SEPTEMBER 1981

PAGES: 2 - 10

TITLE:

A METHOD FOR ADAPTIVE PERFORMANCE IMPROVEMENT OF OPERATING SYSTEM

AUTHOR(s):

REINER, DAVID * PINKERTON, TAD

AFFILIATION:

SPERRY RESEARCH CENTER * UNIVERSITY OF WISCONSIN

ABSTRACT:

THIS PAPER PRESENTS A METHOD FOR DYNAMIC MODIFICATION OF OPERATING SYSTEM CONTROL PARAMETERS TO IMPROVE SYSTEM PERFORMANCE. IMPROVED PARAMETER SETTINGS ARE LEARNED BY EXPERIMENTING ON THE SYSTEM. THE EXPERIMENTS COMPARE THE

PERFORMANCE OF ALTERNATIVE PARAMETER SETTINGS IN EACH REGION OF A PARTITIONED LOAD-PERFORMANCE SPACE ASSOCIATED WITH THE SYSTEM. THE RESULTS ARE USED TO MODIFY IMPORTANT CONTROL PARAMETERS PERIODICALLY, RESPONDING TO FLUCTUATIONS IN SYSTEM LOAD AND PERFORMANCE. THE METHOD CAN BE USED TO IMPLEMENT ADAPTIVE TUNING, TO CHOOSE BETWEEN ALTERNATIVE ALGORITHMS AND POLICIES, OR TO SELECT THE BEST FIXED SETTINGS FOR PARAMETERS WHICH ARE NOT MODIFIED. THE METHOD WAS VALIDATED AND PROVED PRACTICAL BY AN INVESTIGATION OF TWO PARAMETERS GOVERNING CORE QUANTUM ALLOCATION ON A SPERRY UNIVAC 1100 SYSTEM. THIS EXPERIMENT YIELDED SIGNIFICANT RESULTS, WHICH ARE PRESENTED AND DISCUSSED. DIRECTIONS FOR FUTURE RESEARCH INCLUDED AUTOMATING THE METHOD, DETERMINING THE EFFECT OF SIMULTANEOUS MODIFICATIONS TO UNRELATED CONTROL PARAMETERS, AND DETECTING DOMINANT CONTROL PARAMETERS.

KEYWORDS:

OPERATING SYSTEM * PERFORMANCE * DYNAMIC MODIFICATION *
PARAMETER SETTING * SYSTEM PERFORMANCE

CATEGORIES:

4.35

REFERENCE CODE: 132

JOURNAL:

ACM/SIGMETRICS CONFERENCE ON MEASUREMENT AND MODELING OF
COMPUTER SYSTEMS PERFORMANCE EVALUATION REVIEW

VOLUME: 10

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DATE: SEPTEMBER 1981

PAGES: 19 - 32

TITLE:

EVALUATION OF CONCURRENT PHYSICAL DATABASE REORGANIZATION
THROUGH SIMULATION MODELING

AUTHOR(s):

SODERLUND, LARS

AFFILIATION:

SYSTEMS DEVELOPMENT LABORATORY, UNIVERSITY OF STOCKHOLM,
SWEDEN

ABSTRACT:

THE PERFORMANCE OF A DATABASE SYSTEM COMMONLY DETERIORATES
DUE TO DEGRADATION OF THE DATABASE'S PHYSICAL DATA
STRUCTURE. THE STRUCTURE DEGRADATION IS A CONSEQUENCE OF THE
NORMAL OPERATIONS OF A GENERAL DATABASE MANAGEMENT SYSTEM.
WHEN SYSTEM PERFORMANCE HAS DEGRADED BELOW ACCEPTABLE LIMITS

THE DATABASE MUST BE REORGANIZED. IN CONVENTIONAL, PERIODIC REORGANIZATION THE DATABASE, OR PART OF IT, IS TAKEN OFF LINE WHILE THE DATA STRUCTURE IS BEING REORGANIZED. THIS PAPER PRESENTS RESULTS FROM A STUDY WHERE IT IS SHOWN THAT CONCURRENT REORGANIZATION, I.E. A CONTINUOUS REORGANIZATION OF THE PHYSICAL DATA STRUCTURE WHILE APPLICATION PROCESSES HAVE FULL ACCESS TO THE DATABASE, IS AN ATTRACTIVE ALTERNATIVE TO CONVENTIONAL REORGANIZATION. THE PAPER ALSO PRESENTS A SOLUTION TO A METHODOLOGICAL PROBLEM CONCERNING THE SIMULATION OF A SYSTEM WHICH HAS ACTIVITIES WITH EXTREMELY VARYING DURATIONS.

KEYWORDS:

DATABASE * SIMULATION * DATA STRUCTURE * CONCURRENT REORGANIZATION * PERFORMANCE EVALUATION

CATEGORIES:

3.72 * 4.34 * 8.1

REFERENCE CODE: 133

JOURNAL:

ACM/SIGMETRICS CONFERENCE ON MEASUREMENT AND MODELING OF COMPUTER SYSTEMS PERFORMANCE EVALUATION REVIEW

VOLUME: 10

ISSUE: 3

DATE: SEPTEMBER 1981

PAGES: 106 - 109

TITLE:

PERFORMANCE EVALUATION: EXPERIMENTAL COMPUTER SCIENCE AT ITS BEST

AUTHOR(s):

DENNING, PETER J.

AFFILIATION:

COMPUTER SCIENCES DEPARTMENT, PURDUE UNIVERSITY

ABSTRACT:

WHAT IS EXPERIMENTAL COMPUTER SCIENCE? THIS QUESTION HAS BEEN WIDELY DISCUSSED EVER SINCE THE FELDMAN REPORT WAS PUBLISHED (1979). MANY COMPUTER SCIENTISTS BELIEVE THAT SURVIVAL OF THEIR DISCIPLINE IS INTIMATELY LINKED TO THEIR ABILITY TO REJUVENATE EXPERIMENTATION. THE NATIONAL SCIENCE FOUNDATION INSTITUTED THE COORDINATED EXPERIMENTAL RESEARCH PROGRAM(CERP) IN 1979 TO HELP UNIVERSITIES SET UP FACILITIES CAPABLE OF SUPPORTING EXPERIMENTAL RESEARCH. OTHER AGENCIES OF GOVERNMENT ARE CONSIDERING SIMILAR PROGRAMS. SOME INDUSTRIAL FIRMS ARE OFFERING SIMILAR HELP THROUGH MODEST CASH GRANTS AND EQUIPMENT DISCOUNTS. WHAT IS EXPERIMENTAL

COMPUTER SCIENCE? SURPRISINGLY, COMPUTER SCIENTISTS DISAGREE ON THE ANSWER. A FEW BELIEVE THAT COMPUTER SCIENCE IS IN FLUX -- MAKING A TRANSITION FROM THEORETICAL TO EXPERIMENTAL SCIENCE -- AND, HENCE, NO OPERATIONAL DEFINITION IS YET AVAILABLE. SOME BELIEVE THAT IT IS ALL THE NON-THEORETICAL ACTIVITIES OF COMPUTER SCIENCE, ESPECIALLY THOSE CONFERRING "HAND-ON" EXPERIENCE. QUITE A FEW BELIEVE THAT IT IS LARGE SYSTEM DEVELOPMENT PROJECTS -- I.E., COMPUTER AND SOFTWARE ENGINEERING -- AND THEY CITE MIT'S MULTICS, BERKELEY'S VERSION OF BELL LAB'S UNIX, THE ARPANET, IBM'S DATABASE SYSTEM R, AND XEROX'S ETHERNET-BASED PERSONAL COMPUTER NETWORK AS EXAMPLES. THESE BELIEVES ARE WRONG. THERE ARE WELL-ESTABLISHED STANDARDS FOR EXPERIMENTAL SCIENCE. THE FIELD OF PERFORMANCE EVALUATION MEETS THESE STANDARDS AND PROVIDES EXAMPLES OF EXPERIMENTAL SCIENCE FOR THE REST OF THE COMPUTING FIELD.

KEYWORDS:

COMPUTER SCIENCE * PERFORMANCE EVALUATION * EXPERIMENTAL RESEARCH

CATEGORIES:

1 * 1.5 * 2.2

REFERENCE CODE: 134

JOURNAL:

ACM/SIGMETRICS CONFERENCE ON MEASUREMENT AND MODELING OF COMPUTING SYSTEMS

VOLUME: 10

ISSUE: 3

DATE: SEPTEMBER 1981

PAGES: 129 - 132

TITLE:

A LOG FILE DESIGN FOR ANALYZING SECONDARY STORAGE OCCUPANCY

AUTHOR(s):

ARTIS, H. PAT

AFFILIATION:

BELL LABORATORIES, PISCATAWAY, NJ

ABSTRACT:

A DESCRIPTION OF THE DESIGN AND IMPLEMENTATION OF A LOG FILE FOR ANALYZING THE OCCUPANCY OF SECONDARY STORAGE ON IBM COMPUTER SYSTEMS IS DISCUSSED. TYPICAL APPLICATIONS OF THE DATA CONTAINED IN THE LOG ARE ALSO DISCUSSED.

KEYWORDS:

FILE DESIGN * SECONDARY STORAGE * LOG FILE

CATEGORIES:

4.9 * 8

REFERENCE CODE: 135

JOURNAL:

CONFERENCE ON SIMULATION, MEASUREMENT AND MODELING OF
COMPUTER SYSTEMS * PERFORMANCE EVALUATION REVIEW

DATE: SEPTEMBER 1979

PAGES: 19 - 25

TITLE:

RESPONSE ANALYSIS OF A MULTI-FUNCTION SYSTEM

AUTHOR(s):

LINDZEY JR., G. E. * BROWNE, J. C.

AFFILIATION:

DEPARTMENT OF COMPUTER SCIENCES, UNIVERSITY OF TEXAS AT
AUSTIN AND INFORMATION RESEARCH ASSOCIATES

ABSTRACT:

THIS CASE STUDY ILLUSTRATES HOW TWO CAPABILITIES RELATIVELY
RECENTLY INTRODUCED INTO QUEUEING NETWORK MODELS -- MULTIPLE
JOB CLASSES AND SUBNETWORK COLLAPSE -- GREATLY SIMPLIFY THE
FORMULATION AND ANALYSIS OF QUEUEING NETWORK MODELS OF
COMPUTER SYSTEM. THE GOAL OF THE STUDY WAS TO ANALYZE
COMPETITIVE EFFECTS BETWEEN THREE CLASSES OF JOBS IN TERMS
OF RESPONSE TIMES. RESOLUTION OF THE WORKLOAD INTO SEPARATE
CLASSES OF JOBS IS OBVIOUSLY REQUIRED. THE ROLE OF NETWORK
COLLAPSE IS TO CONVERT THE COMPUTATION OF RESPONSES, WHICH
REQUIRES PATH FOLLOWING OF A JOB THROUGH A PERHAPS COMPLEX
SUBNETWORK TRAVERSAL INTO THE READING OF A SINGLE NUMBER,
THE WAIT TIME FOR A COMPOSITE QUEUE. SOME OF THE PITFALLS
AND PROBLEMS TO BE AVOIDED OR CIRCUMVENTED IN THE CASE OF
REPRESENTATIVE COMMERCIAL QUEUEING NETWORK MODELING PACKAGES
ARE DISCUSSED.

KEYWORDS:

QUEUEING NETWORK MODELS * NETWORK * PERFORMANCE EVALUATION

CATEGORIES:

2 * 4.6 * 3.81 * 8.1

REFERENCE CODE: 136

JOURNAL:

CONFERENCE ON SIMULATION, MEASUREMENT AND MODELING OF

COMPUTER SYSTEMS * PERFORMANCE EVALUATION REVIEW
DATE: SEPTEMBER 1979
PAGES: 49 - 56

TITLE:
SIMULATION OF A DISTRIBUTED SYSTEM FOR PERFORMANCE MODELING

AUTHOR(s):
BENNETT, DAVID A. * LANDAUER, CHRISTOPHER A.

AFFILIATION:
PATTERN ANALYSIS AND RECOGNITION CORPORATION

ABSTRACT:
A DISTRIBUTED SYSTEM OF COOPERATING MINICOMPUTERS IS SIMULATED BY AIMER (AUTOMATIC INTEGRATION OF MULTIPLE ELEMENT RADARS) TO MODEL AND ANALYZE THE BEHAVIOR OF A RADAR TRACKING SYSTEM. SIMULATION IS APPLIED IN THE AIMER PROJECT IN AN ATTEMPT TO MODEL A NETWORK OF MINICOMPUTERS TO DISCOVER A MAXIMALLY FLEXIBLE NETWORK ARCHITECTURE. BECAUSE BUILDING THE TRACKING SYSTEM OUT OF REAL HARDWARE WOULD NOT RESULT IN A FLEXIBLE ENOUGH TESTBED SYSTEM, THE PROPOSED CONFIGURATION IS REPRESENTED BY A SOFTWARE EMULATION. THE INSTRUCTION SETS OF THE INDIVIDUAL PROCESSORS ARE EMULATED IN ORDER TO ALLOW SEPARATION OF THE MEASUREMENT FACILITIES FROM THE EXECUTION OF THE SYSTEM. THE EMULATION IS SUPPORTED BY A NANO-DATA QM-1 MICRO AND NANO-PROGRAMMABLE HOST. EXTENSIVE PERFORMANCE MONITORING HOOKS HAVE BEEN BUILT INTO THE EMULATION SYSTEM WHILE ALLOW SMALL PERFORMANCE PERTURBATIONS TO BECOME VISIBLE. THE TRACKING NETWORK IS CONTROLLED BY A COMBINATION FIRMWARE OPERATING SYSTEM AND A SPECIAL EMULATED VIRTUAL CONTROL MACHINES WHOSE INSTRUCTION SETS AND COMPUTATIONAL THROUGHPUT CAN BE PARAMETERIZED WHEN THE MODEL IS GENERATED, OR DYNAMICALLY BY AN OPERATOR DURING A RUN. THE RADAR AND GROUND TRUTH ENVIRONMENTS FOR THE TRACKING SYSTEM ARE SIMULATED WITH LOGIC RESIDENT IN ONE OF THE EMULATED MACHINES, ALLOWING THESE FUNCTIONS TO BE MONITORED AS ACCURATELY AS THE TRACKING ALGORITHMS. THE USE OF THIS SIMULATION TECHNIQUE HAS RESULTED IN AN EXTREMELY FLEXIBLE TESTBED FOR THE DEVELOPMENT OF DISTRIBUTED RADAR TRACKING SYSTEM MODELS. THE TESTBED ITSELF CAN BE QUICKLY TAILORED TO OTHER APPLICATION PROBLEMS.

KEYWORDS:
DISTRIBUTED NETWORK * SIMULATION * NETWORK * PERFORMANCE EVALUATION * NETWORK ARCHITECTURE * SYSTEMS MODELING

CATEGORIES:
3.81 * 4.30 * 7 * 8.1

REFERENCE CODE: 137

JOURNAL:

CONFERENCE ON SIMULATION, MEASUREMENT AND MODELING OF
COMPUTER SYSTEMS * PERFORMANCE EVALUATION REVIEW

DATE: SEPTEMBER 1979

PAGES: 57 - 64

TITLE:

THE BENCHMARKING, TUNING AND ANALYTIC MODELING OF VAX/VMS

AUTHOR(s):

LAZOWSKA, EDWARD D.

AFFILIATION:

UNIVERSITY OF WASHINGTON

ABSTRACT:

THIS PAPER DESCRIBES A RECENT EXPERIENCE IN BENCHMARKING, TUNING AND MODELING DIGITAL EQUIPMENT CORPORATION'S VMS EXECUTIVE RUNNING ON THEIR VAX-11/780 COMPUTER. ALTHOUGH WE EMPHASIZE MODELING HERE, THE THREE ASPECTS ARE CLOSELY INTERRELATED. THE BENCHMARKING AND TUNING EFFORTS ARE OF INTEREST BECAUSE: (1) THEY WERE CONDUCTED WITHOUT SPECIAL TOOLS, USING ONLY THE SCRIPT DRIVER AND MEASUREMENT PACKAGES DELIVERED WITH THE SYSTEM. (2) THEY REVEALED SEVERAL SIGNIFICANT ASPECTS OF SYSTEM BEHAVIOR THAT IN ALL PROBABILITY WOULD HAVE BEEN ABSTRACTED AWAY IN THE COURSE OF THE MODELING EFFORT, HAD IT NOT BEEN PRECEDED BY DETAILED BENCHMARKING AND TUNING. (3) A FOUR-FOLD AVERAGE IMPROVEMENT IN BENCHMARK PERFORMANCE WAS ACHIEVED, WITH GREATER IMPROVEMENT FOR SPECIFIC CUSTOMER CLASSES. THE MODELING EFFORTS IS OF INTEREST BECAUSE: (1) CONVENTIONAL HIERARCHICAL MODELING TECHNIQUES ARE NOT DIRECTLY APPLICABLE TO A SYSTEM IN WHICH A SINGLE DISK IS USED FOR PAGING, SWAPPING, AND USER I/O ACTIVITY. IN PARTICULAR, SWAPPING IS SIGNIFICANT BOTH AT A HIGH LEVEL, WHERE IT DELAYS A CUSTOMER'S ADMISSION TO THE MULTIPROGRAMMING SET, AND AT A LOW LEVEL, WHERE IT AFFECTS THE THROUGHPUT OF PAGING AND USER I/O REQUESTS. (2) THE MULTIPLICITY OF MEMORY MANAGEMENT MECHANISMS IN VMS LEAD TO BEHAVIOR THAT IS DIFFICULT TO COMPREHEND, FURTHER INCREASING THE CHALLENGE IN CALCULATING LOAD-DEPENDENT THROUGHPUT RATES. (3) THE RESULTING MODEL DEMONSTRATES GOOD AGREEMENT WITH MEASURED PERFORMANCE OVER A FAIRLY WIDE RANGE OF CONDITIONS.

KEYWORDS:

SIMULATION * BENCHMARKING * TUNING * PERFORMANCE EVALUATION
* SYSTEM MODELING

CATEGORIES:

3.51 * 3.81 * 4.32 * 4.6 * 8.1

REFERENCE CODE: 138

JOURNAL:

CONFERENCE ON SIMULATION, MEASUREMENT AND MODELING OF
COMPUTER SYSTEMS * PERFORMANCE EVALUATION REVIEW

DATE: SEPTEMBER 1979

PAGES: 163 - 172

TITLE:

A TECHNIQUE FOR INTEGRATING SIMULATION AND SYSTEM DESIGN

AUTHOR(s):

SANGUINETTI, JOHN

AFFILIATION:

DIGITAL EQUIPMENT CORPORATION

ABSTRACT:

A TECHNIQUE FOR SIMULATING INCOMPLETE SYSTEMS IS GIVEN WHICH
ALLOWS PERFORMANCE PREDICTION DURING SYSTEM DESIGN. THIS
TECHNIQUES, CALLED INTEGRATED SIMULATION, ALLOWS THE SYSTEM
DESIGN TO ITSELF BE A SIMULATION, THUS AVOIDING THE OVERHEAD
OF MAINTAINING A SEPARATE, VALID SIMULATION MODEL FOR THE
SYSTEM. THE PAPER PRESENTS INTEGRATED SIMULATION IN THE
FRAMEWORK OF A SYSTEM MODELING LANGUAGE CALLED THE PROGRAM
PROCESS MODELING LANGUAGE, PPML. THIS LANGUAGE PROVIDES A
MEANS FOR DESCRIBING SYSTEMS OF CONCURRENT PROCESSES IN BOTH
ABSTRACT AND EXPLICIT TERMS, THUS LEADING ITSELF WELL TO A
TOP-DOWN DESIGN METHOD. IN THE DESIGN PROCESS, ANY PPML
REPRESENTATION OF THE SYSTEM CAN BE SIMULATED DIRECTLY, FROM
THE MOST ABSTRACT DESIGN TO THE COMPLETELY ELABORATED
SYSTEM. SIMULATION OF THE COMPLETELY ELABORATED SYSTEM IS,
IN FACT, SIMPLY THE SYSTEM IN EXECUTION. THE PAPER DEFINES
PPML AND DESCRIBES THE TECHNIQUES REQUIRED TO SIMULATE PPML
SYSTEMS GIVEN VARIOUS UNDERLYING MACHINES. IT INCLUDES, WITH
A DISCUSSION OF THE LIMITATIONS OF THE INTEGRATED SIMULATION
METHOD.

KEYWORDS:

SIMULATION * SYSTEM DESIGN * SYSTEM MODELING * PERFORMANCE
EVALUATION

CATEGORIES:

3.51 * 3.72 * 4.1 * 4.22 * 4.6 * 7.4 * 8.1

REFERENCE CODE: 139

JOURNAL:

CONFERENCE ON SIMULATION, MEASUREMENT AND MODELING OF
COMPUTER SYSTEMS * PERFORMANCE EVALUATION REVIEW

DATE: SEPTEMBER 1979
PAGES: 173 - 182

TITLE:
PERFORMANCE SPECIFICATIONS AND ANALYSIS OF SOFTWARE DESIGNS

AUTHOR(s):
SMITH, CONNIE * BROWNE, J. C.

AFFILIATION:
DEPARTMENT OF COMPUTER SCIENCES, UNIVERSITY OF TEXAS, AUSTIN

ABSTRACT:
A METHODOLOGY IS DEFINED THAT WILL INTEGRATE THE SOFTWARE DEVELOPMENT PROCESS WITH COMPUTER PERFORMANCE EVALUATION AND CAPACITY PLANNING PROCESSES. SYSTEMS ANALYSTS PROVIDE SPECIFICATIONS ON EXECUTION CHARACTERISTICS OF SOFTWARE DESIGNS AND EVALUATE THEM WITH RESPECT TO PERFORMANCE GOALS. THE PROCESS IS REPEATED, AS IMPLEMENTATION PROCEEDS, TO MONITOR THE PERFORMANCE THROUGHOUT SOFTWARE DEVELOPMENT. PERFORMANCE CRISES CAN BE AVERTED BY PROPER CONSIDERATION OF SOFTWARE IMPACT PRIOR TO IMPLEMENTATION. THE DATA OBTAINED CAN BE USED BY PERFORMANCE ANALYSTS FOR MORE ACCURATE LONG-RANGE PLANNING.

KEYWORDS:
PERFORMANCE EVALUATION * SOFTWARE DESIGN * SYSTEMS ANALYSIS

CATEGORIES:
3.51 * 4.1 * 4.2 * 4.31 * 4.6

REFERENCE CODE: 140

JOURNAL:
CONFERENCE ON SIMULATION, MEASUREMENT AND MODELING OF
COMPUTER SYSTEMS * PERFORMANCE EVALUATION REVIEW
DATE: SEPTEMBER 1979
PAGES: 249 - 257

TITLE:
BENCHMARKING INTERACTIVE SYSTEMS: PRODUCING THE SOFTWARE

AUTHOR(s):
SPOONER, CHRISTOPHER R.

AFFILIATION:
METREK DIVISION, THE MITRE CORPORATION

ABSTRACT:
THE AUTHOR HAS RECENTLY DEVELOPED A NEW METHODOLOGY OF BENCHMARKING, WHICH IS BEING APPLIED TO A PROCUREMENT IN

WHICH (A) A SINGLE INTEGRATED INTERACTIVE APPLICATION IS TO SPAN A DISTRIBUTED CONFIGURATION OF COMPUTING HARDWARE, (B) THE CONFIGURATION IS UNKNOWN WHEN THE BENCHMARK IS BEING DEVELOPED, AND (C) THE APPLICATION TO SOFTWARE WILL BE WRITTEN AFTER THE BENCHMARK HAS BEEN RUN. THE BUYER PREPARES A SIMULATION MODEL OF THE INTENDED APPLICATION IN THE FORM OF PROGRAMS THAT WILL RUN ON THE HARDWARE BEING BENCHMARKED. EACH COMPETING VENDOR IS EXPECTED TO TUNE THE PERFORMANCE OF THIS MODEL TO THE HARDWARE CONFIGURATION THAT HE HAS PROPOSED, SO HE WILL REQUIRE SEVERAL VERSIONS OF THE MODEL. THIS PRESENTS THE BUYER WITH A FORMIDABLE SOFTWARE-PRODUCTION PROBLEM, WHICH IS FURTHER COMPLICATED BY A REQUIREMENT FOR EXTREME FLEXIBILITY AND RELIABILITY. THE PAPER ADDRESSES THE SOFTWARE-PRODUCTION PROBLEM AND DESCRIBES ITS SOLUTION. THE SOLUTION WAS TO DEVELOP AN AUTOMATED CODE-PRODUCTION SYSTEM BASED ON TWO PRINCIPAL DESIGN FEATURES. FIRST, THE MODEL AND ITS TRANSLATOR ARE BOTH WRITTEN IN THE SAME LANGUAGE; SECONDLY, THE COMMON LANGUAGE IS SELECTED ON THE BASIS OF READABILITY AND EXTENSIBILITY. THE PAPER EXAMINES WHY THIS APPROACH TO THE CODE-PRODUCTION PROBLEM WAS SUCCESSFUL. THOUGH THE CODE-PRODUCTION SYSTEM WAS DEVELOPED TO SUPPORT A PARTICULAR BENCHMARKING APPROACH, IT SHOULD ALSO BE USEFUL IN OTHER MODELING SITUATIONS. INDEED IT MIGHT BE OF INTEREST IN ANY FIELD WHERE READABILITY, RELIABILITY, EASE OF MAINTENANCE, AND ECONOMY OF PROGRAMMING EFFORT ARE CONSIDERED IMPORTANT.

KEYWORDS:

BENCHMARKING * SIMULATION * SYSTEM MODELING * SOFTWARE *
DISTRIBUTED NETWORK * PERFORMANCE EVALUATION

CATEGORIES:

3.51 * 3.81 * 4.2 * 4.32 * 4.6 * 7.3 * 8.1

REFERENCE CODE: 141

JOURNAL:

CONFERENCE ON SIMULATION, MEASUREMENT AND MODELING OF
COMPUTER SYSTEMS * PERFORMANCE EVALUATION REVIEW

DATE: SEPTEMBER 1979

PAGES: 259 - 267

TITLE:

CRITERIA FOR COMPUTER PERFORMANCE EVALUATION

AUTHOR(s):

DUJMOVIC, JOZE J.

AFFILIATION:

DEPARTMENT OF COMPUTER AND INFORMATION SCIENCE, DEPARTMENT
OF ELECTRICAL ENGINEERING, UNIVERSITY OF FLORIDA

ABSTRACT:

COMPUTER EVALUATION, COMPARISON, AND SELECTION IS ESSENTIALLY A DECISION PROCESS. THE DECISION MAKING IS BASED ON A NUMBER OF WORTH INDICATORS. THE PERFORMANCE INDICATORS ARE OBTAINED THROUGH THE COMPUTER PERFORMANCE MEASUREMENT PROCEDURE. CONSEQUENTLY, THIS PROCEDURE SHOULD BE COMPLETELY CONDITIONED BY THE DECISION PROCESS. THIS PAPER INVESTIGATES VARIOUS ASPECTS OF COMPUTER PERFORMANCE MEASUREMENT AND EVALUATION PROCEDURE WITHIN THE CONTEXT OF COMPUTER EVALUATION, COMPARISON AND SELECTION PROCESS BASED ON THE LOGIC SCORING OF PREFERENCE METHOD. THE SET OF ELEMENTARY CRITERIA FOR PERFORMANCE EVALUATION IS PROPOSED AND THE CORRESPONDING SET OF PERFORMANCE INDICATORS IS DEFINED. THE NECESSARY PERFORMANCE MEASUREMENTS ARE BASED ON THE STANDARDIZED SET OF SYNTHETIC BENCHMARK PROGRAMS AND INCLUDE THREE SEPARATE MEASUREMENTS: MONOPROGRAMMING PERFORMANCE MEASUREMENT, MULTIPROGRAMMING PERFORMANCE MEASUREMENT, AND MULTIPROGRAMMING EFFICIENCY MEASUREMENT. USING THE PROPOSED ELEMENTARY CRITERIA, THE MEASURED PERFORMANCE INDICATORS CAN BE TRANSFORMED INTO ELEMENTARY PREFERENCES AND AGGREGATED WITH OTHER NON-PERFORMANCE ELEMENTARY PREFERENCES OBTAINED THROUGH THE EVALUATION PROCESS. THE APPLICABILITY OF PRESENTED ELEMENTARY CRITERIA IS ILLUSTRATED BY NUMERICAL EXAMPLES.

KEYWORDS:

PERFORMANCE EVALUATION * BENCHMARKING * DECISION-MAKING *
SYSTEM MODELING * MONOPROGRAMMING * MULTIPROGRAMMING

CATEGORIES:

3.51 * 3.8 * 4.19 * 4.32 * 4.6 * 8.3

REFERENCE CODE: 142

JOURNAL:

ACM-SIGMETRICS / THE 7TH IFIP W.G.7.3, PERFORMANCE 80
(PROCEEDINGS OF PERFORMANCE 80 , PERFORMANCE EVALUATION
REVIEW)

VOLUME: 9

ISSUE: 2

DATE: JUNE 1980

PAGES: 11 - 25

TITLE:

XRAY: INSTRUMENTATION FOR MULTIPLE COMPUTERS

AUTHOR(s):

BLAKE, RUSS

AFFILIATION:

TANDEM COMPUTER INC.

ABSTRACT:

XRAY PRESENTS A GLOBAL VIEW OF THE PERFORMANCE OF HARDWARE AND SOFTWARE COMPONENTS ON MULTIPLE, DISTRIBUTED COMPUTERS. THE SET OF COMPUTERS CHOSEN FOR MEASUREMENT CAN BE CHANGED AT ANY TIME THROUGHOUT A NETWORK OF SYSTEMS, AND CAN BE SELECTED TO MINIMIZE DATA COLLECTION TIME AND MEASUREMENT SPACE. IN THE COURSE OF NORMAL ACTIVITIES THE OPERATING SYSTEM EXECUTES FIRMWARE WHICH INCREMENTS COUNTERS FOR THE MEASURED COMPONENTS. PERIODICALLY, THE COUNTERS ARE RECODED IN AN ORDINARY FILE BY A PROCESS IN EACH PROCESSOR. AN ANALYSIS PROGRAM PERMITS BROWSING THROUGH COMPONENTS AND PLOTTING COUNTERS IN REAL TIME. ANALYSIS FOCUSES ON DETECTING THE DISTRIBUTED SOURCES OF EXCESSIVE ACTIVITY.

KEYWORDS:

PERFORMANCE EVALUATION * REAL TIME SYSTEM * NETWORK * DISTRIBUTED NETWORK

CATEGORIES:

2.44 * 3.81 * 4.3 * 5.25 * 6.2 * 7

REFERENCE CODE: 143

JOURNAL:

ACM-SIGMETRICS / THE 7TH IFIP W.G.7.3, PERFORMANCE 80
(PROCEEDINGS OF PERFORMANCE 80, PERFORMANCE EVALUATION
REVIEW)

VOLUME: 9

ISSUE: 2

DATE: JUNE 1980

PAGES: 35 - 41

TITLE:

BENCHMARKING INTERACTIVE SYSTEMS: CALIBRATING THE MODEL

AUTHOR(s):

BASHIOUM, DOUGLAS L.

AFFILIATION:

THE MITRE CORPORATION, METREK DIVISION

ABSTRACT:

A METHODOLOGY FOR BENCHMARKING DEDICATED, INTERACTIVE SYSTEMS HAS BEEN DEVELOPED AT THE MITRE CORPORATION. THIS METHODOLOGY USES A SYNTHETIC PROGRAM MODEL OF THE APPLICATION WHICH RUNS ON THE PROPOSED HARDWARE / OPERATING SYSTEM CONFIGURATIONS AND IS DRIVEN BY A STATISTICALLY DERIVED LOAD. SYSTEM PERFORMANCE IS MEASURED BY ANALYZING THE SYNTHETIC TRANS- ACTION RESPONSE TIMES. THE METHODOLOGY

YIELDS ASSURANCES TO A BUYER THAT THE BENCHMARKED SYSTEM HAS AT LEAST AN A PRIORI DEFINED AMOUNT OF COMPUTER POWER AVAILABLE FOR APPLICATIONS ORIENTED SOFTWARE. THIS PAPER EXAMINES THE METHODOLOGY AND THE PROBLEMS THAT WERE ENCOUNTERED AND SOLUTIONS WHICH HAS BEEN USED IN CALIBRATING A BENCHMARK MODEL FOR A SPECIFIC APPLICATION. THE BENCHMARK WAS DESIGNED TO MODEL A LARGE INTERACTIVE INFORMATION PROCESSING APPLICATION ON A PROCUREMENT REQUIRING LOOSELY-COUPLED (NO SHARED MEMORY) MULTI-COMPUTER SYSTEMS. THE MODEL CONSISTS OF A SET OF INTERACTING SYNTHETIC PROGRAM CELLS, EACH COMPOSED OF SEVERAL ABSTRACTLY DEFINED COMPONENTS. THE MODEL IS MAINTAINED IN A VERY HIGH LEVEL LANGUAGE THAT IS AUTOMATICALLY TRANSLATED INTO A STANDARD HIGH ORDER LANGUAGE (TYPICALLY FORTRAN OR COBOL) FOR DELIVERY TO THE COMPETING VENDORS. THESE DELIVERED MODEL CELLS CONTAIN AUTOMATICALLY GENERATED SIZE AND TIME FILLER CODE THAT "CALIBRATE" THE CELLS TO CONSUME THE APPROPRIATE CPU TIME AND MEMORY SPACE AS DEFINED BY THE ABSTRACT SIZE UNITS AFTER ACCOUNTING FOR EACH VENDOR'S HARDWARE AND PROPOSED SYSTEM DESIGN.

KEYWORDS:

BENCHMARK * CALIBRATION * COMPUTER PERFORMANCE MEASUREMENT *
DISTRIBUTED PROCESSING * INTERACTIVE SYSTEMS * MODELING *
REAL-TIME * SIMULATION * SYNTHETIC PROGRAM

CATEGORIES:

2.44 * 3.8 * 4 * 4.32 * 4.6 * 7 * 8.1

REFERENCE CODE: 144

JOURNAL:

ACM-SIGMETRICS / THE 7TH IFIP W.G.7.3, PERFORMANCE 80
(PROCEEDINGS OF PERFORMANCE 80, PERFORMANCE EVALUATION
REVIEW)

VOLUME: 9

ISSUE: 2

DATE: JUNE 1980

PAGES: 55 - 66

TITLE:

METHODOLOGY AND EMPIRICAL RESULTS OF PROGRAM BEHAVIOUR
MEASUREMENTS

AUTHOR(s):

ALANKO, TIMO O. * HAIKALA, ILKKA J. * KUTVONEN, PETRI H.

AFFILIATION:

DEPARTMENT OF COMPUTER SCIENCE, UNIVERSITY OF HELSINKI,
FINLAND

ABSTRACT:

PROGRAM BEHAVIOUR CHARACTERISTICS WERE EXAMINED USING DATA GATHERED FROM REAL PROGRAM EXECUTIONS. EXPERIMENTS WERE PERFORMED IN A SEGMENTED VIRTUAL MEMORY WITH A WORKING SET POLICY; THE ANALYZING COSTS WERE KEPT LOW USING AN EFFICIENT DATA REDUCTION METHOD. EMPIRICAL RESULTS WERE OBTAINED CONCERNING THE INFLUENCE OF THE WINDOW SIZE ON PROGRAM BEHAVIOUR CHARACTERISTICS, THE ACCURACY OF SOME AVERAGE WORKING SET SIZE APPROXIMATIONS AND THE SENSITIVITY OF PROGRAM BEHAVIOUR TO THE PROGRAM'S INPUT DATA. THESE RESULTS SHOW THAT SOME COMMONLY USED ASSUMPTIONS CONCERNING PROGRAM BEHAVIOUR ARE INACCURATE. ALSO THERE SEEM TO EXIST "ILL-BEHAVING" PROGRAMS, THE BEHAVIOUR OF WHICH DOES NOT CORRESPOND WELL WITH RESULTS OBTAINED EARLIER. THE EFFECTS OF REAL-TIME DELAYS DURING PROGRAM EXECUTION WERE CONSIDERED USING A NEW SIMPLE METHOD. AS AN ADDITIONAL EXPERIMENT, SEGMENTING AND PAGING WERE COMPARED USING VARIOUS PERFORMANCE STATISTICS; THE RESULTS SEEM TO FAVOR SEGMENTING.

KEYWORDS:

PROGRAM MEASUREMENT * PERFORMANCE EVALUATION * REAL-TIME SYSTEM * PROGRAMMING

CATEGORIES:

2.4 * 3.72 * 4.2 * 4.6 * 5.24

REFERENCE CODE: 145

JOURNAL:

ACM-SIGMETRICS / THE 7TH IFIP W.G.7.3, PERFORMANCE 80
(PROCEEDINGS OF PERFORMANCE 80, PERFORMANCE EVALUATION REVIEW)

VOLUME: 9

ISSUE: 2

DATE: JUNE 1980

PAGES: 145 - 152

TITLE:

COMPUTER CAPACITY PLANNING USING QUEUEING NETWORK MODELS

AUTHOR(s):

LO, T. L.

AFFILIATION:

MCDONNELL DOUGLAS AUTOMATION COMPANY, ST. LOUIS, MISSOURI

ABSTRACT:

THIS PAPER PRESENTS SEVERAL COMPUTER CAPACITY PLANNING CASE STUDIES USING A MODELING TOOL, BEST/L, DERIVED FROM THE THEORY OF QUEUEING NETWORKS. ALL PERFORMANCE PREDICTIONS WERE EVALUATED BASED ON THE SELECTED SERVICE LEVELS SUCH AS

RESPONSE TIMES AND THROUGHPUTS. ADVANTAGES AND DISADVANTAGES OF USING THE MODELING APPROACH ARE ALSO BRIEFLY DISCUSSED.

KEYWORDS:

QUEUEING NETWORK MODEL * NETWORK * SYSTEM MODELING * PERFORMANCE EVALUATION

CATEGORIES:

2.94 * 3.72 * 7.4 * 8.1

REFERENCE CODE: 146

JOURNAL:

ACM-SIGMETRICS / THE 7TH IFIP W.G.7.3, PERFORMANCE 80
(PROCEEDINGS OF PERFORMANCE 80, PERFORMANCE EVALUATION REVIEW)

VOLUME: 9

ISSUE: 2

DATE: JUNE 1980

PAGES: 245 - 253

TITLE:

ASPECTS OF SOFTWARE DESIGN ANALYSIS: CONCURRENCY AND BLOCKING

AUTHOR(s):

SMITH, CONNIE * BROWNE, J. C.

AFFILIATION:

DEPARTMENT OF COMPUTER SCIENCES, THE UNIVERSITY OF TEXAS AT AUSTIN

ABSTRACT:

THIS PAPER EXTENDS PREVIOUS WORK ON DEVELOPMENT OF A METHODOLOGY FOR THE PREDICTION OF THE PERFORMANCE OF COMPUTER SOFTWARE SYSTEMS FROM DESIGN LEVEL SPECIFICATIONS AND CONTINUING THROUGH IMPLEMENTATION. THE EFFECTS OF SYNCHRONIZED BEHAVIOR, SUCH AS RESULTS FROM DATA RESERVATION IN MULTI- THREAD EXECUTIONS OF DATA BASE SYSTEMS, AND COMPETITION FOR HOST SYSTEM RESOURCES ARE INCORPORATED. THE PREVIOUS METHODOLOGY USES HIERARCHICAL GRAPHS TO REPRESENT THE EXECUTION OF SOFTWARE ON SOME HOST COMPUTER SYSTEM (OR ON SOME ABSTRACT MACHINE). PERFORMANCE METRICS SUCH AS RESPONSE TIME WERE OBTAINED FROM ANALYSIS OF THESE GRAPHS ASSUMING EXECUTION OF A SINGLE COPY ON A DEDICATED HOST. THIS PAPER DISCUSSES THE MAPPING OF THESE EXECUTION GRAPHS UPON QUEUEING NETWORK MODELS OF THE HOST COMPUTING ENVIRONMENT TO YIELD PERFORMANCE METRIC ESTIMATES FOR MORE COMPLEX AND REALISTIC PROCESSING ENVIRONMENTS.

KEYWORDS:

CONCURRENCY * BLOCKING * SOFTWARE DESIGN * PERFORMANCE

EVALUATION * QUEUEING NETWORK MODEL * DATABASE * NETWORK *
SOFTWARE

CATEGORIES:

2.49 * 3.7 * 3.81 * 4.1 * 4.2 * 5.24 * 7.4

REFERENCE CODE: 147

JOURNAL:

ACM-SIGMETRICS / THE 7TH IFIP W.G.7.3, PERFORMANCE 80
(PROCEEDINGS OF PERFORMANCE 80, PERFORMANCE EVALUATION
REVIEW)

VOLUME: 9

ISSUE: 2

DATE: JUNE 1980

PAGES: 257 - 263

TITLE:

OPTIMIZATION OF THE NUMBER OF COPIES IN A DISTRIBUTION DATA
BASE

AUTHOR(s):

COFFNAN, E. G. * GELENBE, E. * PLATEAU, B.

AFFILIATION:

BELL LABORATORIES, MURRAY HILL, NEW JERSEY (U.S.A.) *
LABORATOIRE DE RECHERCHE EN INFORMATIQUE, UNIVERSITE DE
PARIS-SUD, FRANCE * LABORATOIRE DE RECHERCHE EN
INFORMATIQUE, UNIVERSITE DE PARIS-SUD, FRANCE

ABSTRACT:

WE CONSIDER THE EFFECT ON SYSTEM PERFORMANCE OF THE
DISTRIBUTION OF A DATA BASE IN THE FORM OF MULTIPLE COPIES
AT DISTINCT SITES. THE PURPOSE OF OUR ANALYSIS IS TO
DETERMINE THE GAIN IN READ THROUGHPUT THAT CAN BE OBTAINED
IN THE PRESENCE OF CONSISTENCY PRESERVING ALGORITHMS THAT
HAVE TO BE IMPLEMENTED WHEN UPDATE OPERATIONS ARE CARRIED
OUT ON EACH COPY. WE SHOW THAT READ THROUGHPUT DIMINISHES IF
THE NUMBER OF COPIES EXCEEDS AN OPTIMAL VALUE. THE
THEORETICAL MODEL WE DEVELOP IS APPLIED TO A SYSTEM IN WHICH
CONSISTENCY IS PRESERVED THROUGH THE USE OF ELLIS'S RING
ALGORITHM.

KEYWORDS:

DATABASE * PERFORMANCE EVALUATION * ALGORITHMS * SYSTEM
MODELING

CATEGORIES:

4.3 * 4.41 * 4.6 * 7.4

REFERENCE CODE: 148

JOURNAL:

ACM-SIGMETRICS, 1981 ACM WORKSHOP/SYMPOSIUM ON MEASUREMENT
AND EVALUATION OF SOFTWARE QUALITY

VOLUME: 10

ISSUE: 1

DATE: MARCH 1981

PAGES: 179 - 187

TITLE:

THE APPLICATION DEVELOPMENT PROCESS: WHAT'S WRONG WITH IT?

AUTHOR(s):

CROWLEY, JOHN D.

AFFILIATION:

JDC ASSOCIATES

ABSTRACT:

THIS PAPER WILL EXAMINE THE PROCESS USED IN THE DEVELOPMENT
OF COMPUTER APPLICATIONS. THE CLAIM IS MADE THAT THE CURRENT
METHODOLOGY HAS SERIOUS DEFICIENCIES, BUT THAT A SOFTWARE
DEVELOPMENT APPROACH IS BECOMING AVAILABLE TO HELP ADDRESS
THESE PROBLEMS.

KEYWORDS:

SOFTWARE DEVELOPMENT * SOFTWARE * COMPUTER APPLICATIONS

CATEGORIES:

3.51 * 4.6

REFERENCE CODE: 149

JOURNAL:

PERFORMANCE EVALUATION REVIEW

VOLUME: 11

ISSUE: 2

DATE: JUNE 1982

PAGES: 17 - 28

TITLE:

TOWARD A PARAMETRIC APPROACH FOR MODELING LOCAL AREA NETWORK
PERFORMANCE

AUTHOR(s):

MAGER, PETER S.

AFFILIATION:

BGS SYSTEMS, INC., WALTHAM, MASS.

ABSTRACT:

THE TASK OF MODELING THE PERFORMANCE OF A SINGLE COMPUTER (HOST) WITH ASSOCIATED PERIPHERAL DEVICES IS NOW WELL UNDERSTOOD. IN FACT, HIGHLY USABLE TOOLS BASED ON ANALYTICAL MODELING TECHNIQUES ARE COMMERCIALY AVAILABLE AND IN WIDESPREAD USE THROUGHOUT THE INDUSTRY. THESE TOOLS PROVIDE A MECHANISM FOR DESCRIBING COMPUTERIZED MANNER. THIS IS IMPORTANT BECAUSE IT ALLOWS USERS TO DESCRIBE THEIR COMPUTE ENVIRONMENTS IN A STRUCTURED WAY THAT AVOIDS UNNECESSARY COMPLEXITY. IT ALSO IS HELPFUL IN FACILITATING INTUITIVE INTERPRETATIONS OF MODELING RESULTS AND APPLYING THEM TO CAPACITY PLANNING DECISIONS. A FIRST STEP TOWARD BUILDING A MODELING TOOL AND ASSOCIATED NETWORK SPECIFICATION LANGUAGE THAT ALLOWS STRAIGHTFORWARD, INEXPENSIVE, AND INTERPRETABLE MODELING OF MULTI-COMPUTER NETWORK PERFORMANCE IS TO IDENTIFY THE SET OF CHARACTERISTICS (PARAMETERS) THAT MOST HEAVILY INFLUENCE THAT PERFORMANCE. THE RESULT OF SUCH A STUDY FOR THE COMMUNICATION ASPECTS OF LOCAL AREA NETWORKS IS THE SUBJECT OF THIS PAPER.

KEYWORDS:

LOCAL AREA NETWORK * NETWORK * NETWORK MODELING * COMMUNICATIONS * PERFORMANCE EVALUATION * SIMULATION * MODELING TOOLS

CATEGORIES:

7.1 * 7.4 * 8.1

REFERENCE CODE: 150

JOURNAL:

PROCEEDINGS OF THE 1982 ACM SIGMETRICS CONFERENCE ON MEASUREMENT AND AND MODELING OF COMPUTER SYSTEMS (PERFORMANCE EVALUATION REVIEW)

VOLUME: 11

ISSUE: 4

DATE: DECEMBER 1982

PAGES: 39 - 50

TITLE:

WORKLOAD CHARACTERIZATION AND PERFORMANCE EVALUATION IN A RESEARCH ENVIRONMENT

AUTHOR(s):

HODGES, LARRY F. * STEWART, WILLIAM J.

AFFILIATION:

NORTH CAROLINA STATE UNIVERSITY

ABSTRACT:

THIS PAPER DESCRIBES THE PROCESS OF BENCHMARKING THE DIVERSE RESEARCH ENVIRONMENT THAT CONSTITUTES THE WORKLOAD OF VAX/VMS AT THE UNIVERSITY ANALYSIS AND CONTROL CENTER AT NORTH CAROLINA STATE UNIVERSITY. THE BENCHMARKING PROCESS BEGAN WITH A STUDY OF THE SYSTEM LOADING AND PERFORMANCE CHARACTERISTICS OVER THE SIX-MONTH PERIOD FROM JANUARY TO JUNE OF 1981. STATISTICS WERE COMPILED ON THE NUMBER OF ACTIVE USERS, CPU USAGE BY INDIVIDUAL ACCOUNTS, AND PEAK LOAD PERIODS. INDIVIDUAL USERS WERE INTERVIEWED TO DETERMINE THE NATURE AND MAJOR COMPUTING CHARACTERISTICS OF THE RESEARCH THEY WERE CONDUCTING ON VAX. INFORMATION FROM ALL SOURCES WAS COMPILED TO PRODUCE A BENCHMARK THAT CLOSELY PARALLELED ACTUAL SYSTEM ACTIVITY. AN ANALYTIC MODEL WAS INTRODUCED AND USED IN CONJUNCTION WITH THE BENCHMARK DATA AND HARDWARE CHARACTERISTICS TO DERIVE PERFORMANCE MEASURES FOR THE SYSTEM. COMPARISONS WITH MEASURED SYSTEM PERFORMANCE WERE CONDUCTED TO DEMONSTRATE THE ACCURACY OF THE MODEL. THE MODEL WAS THEN EMPLOYED TO PREDICT PERFORMANCE AS THE SYSTEM WORKLOAD WAS INCREASED, TO SUGGEST IMPROVEMENTS FOR THE SYSTEM, AND TO EXAMINE THE EFFECTS OF THOSE IMPROVEMENTS.

KEYWORDS:

PERFORMANCE EVALUATION * BENCHMARKING * SYSTEM MODELING *
SYSTEMS ANALYSIS

CATEGORIES:

3.51 * 8.1

REFERENCE CODE: 151

JOURNAL:

PROCEEDINGS OF THE 1982 ACM SIGMETRICS CONFERENCE ON
MEASUREMENT AND MODELING OF COMPUTER SYSTEMS (PERFORMANCE
EVALUATION REVIEW)

VOLUME: 11

ISSUE: 4

DATE: DECEMBER 1982

PAGES: 151 - 162

TITLE:

PERFORMANCE ANALYSIS OF SOFTWARE FOR AN MIMD COMPUTER

AUTHOR(s):

SMITH, CONNIE U. * LOENDORF, DAVID D.

AFFILIATION:

DEPARTMENT OF COMPUTER SCIENCE, DUKE UNIVERSITY

ABSTRACT:

THIS PAPER PRESENTS A TECHNIQUE FOR MODELING AND ANALYZING
THE PERFORMANCE OF SOFTWARE FOR AN MIMD (MULTIPLE

INSTRUCTION MULTIPLE DATA) COMPUTER. THE MODELS CAN BE USED AS AN ALTERNATIVE TO EXPERIMENTATION FOR THE EVALUATION OF VARIOUS ALGORITHMS AND DIFFERENT DEGREES OF PARALLELISM. THEY CAN ALSO BE USED TO STUDY THE TRADEOFFS INVOLVED IN INCREASING THE AMOUNT OF PARALLEL COMPUTATION AT THE EXPENSE OF INCREASED OVERHEAD FOR SYNCHRONIZATION AND COMMUNICATION. THE DETECTION AND ALLEVIATION OF PERFORMANCE BOTTLENECKS IS FACILITATED.

KEYWORDS:

PERFORMANCE EVALUATION * SOFTWARE MODELING * SOFTWARE * BOTTLENECKS

CATEGORIES:

4.1 * 4.32 * 4.6 * 5.24 * 5.25 * 8.1

REFERENCE CODE: 152

JOURNAL:

PROCEEDINGS OF THE 1982 ACM SIGMETRICS CONFERENCE ON MEASUREMENT AND MODELING OF COMPUTER SYSTEMS (PERFORMANCE EVALUATION REVIEW)

VOLUME: 11

ISSUE: 4

DATE: DECEMBER 1982

PAGES: 215 - 221

TITLE:

ERROR ANALYSIS OF HOMOGENEOUS MEAN QUEUE AND RESPONSE TIME ESTIMATORS

AUTHOR(s):

BRUMFIELD, JEFFREY A * DENNING, PETER J.

AFFILIATION:

PURDUE UNIVERSITY

ABSTRACT:

FLOW BALANCE AND HOMOGENEITY ASSUMPTIONS ARE NEEDED TO DERIVE OPERATIONAL COUNTERPARTS OF M/M/1 QUEUE LENGTH AND RESPONSE TIME FORMULAS. THIS PAPER PRESENTS RELATIONSHIPS BETWEEN THE ASSUMPTION ERRORS AND THE ERRORS IN THE QUEUE LENGTH AND RESPONSE TIME ESTIMATES. A SIMPLER SET OF ASSUMPTION ERROR MEASURES IS USED TO DERIVE BOUNDS ON THE ERROR IN THE RESPONSE TIME ESTIMATE. AN EMPIRICAL STUDY COMPARES ACTUAL ERRORS WITH THEIR BOUNDS.

KEYWORDS:

QUEUEING THEORY * QUEUE LENGTH * ERROR ANALYSIS * QUEUE MODELING * HOMOGENEOUS MEAN QUEUE * TIME ESTIMATOR * RESPONSE TIME ESTIMATORS

CATEGORIES:

5.11 * 5.5 * 8.1

REFERENCE CODE: 153

JOURNAL:

PROCEEDINGS OF THE 1983 ACM SIGMETRICS CONFERENCE ON
MEASUREMENT AND MODELING OF COMPUTER SYSTEMS (PERFORMANCE
EVALUATION REVIEW)

DATE: AUGUST 1983

PAGES: 70 - 81

TITLE:

WORKLOAD REPRESENTATIONS IN QUEUEING MODELS OF COMPUTER
SYSTEMS

AUTHOR(s):

ZAHARJAN, JOHN

AFFILIATION:

UNIVERSITY OF WASHINGTON

ABSTRACT:

THERE ARE TWO BASIC REPRESENTATIONS OF WORKLOAD POPULATIONS. IN LOAD INDEPENDENT, SEPARABLE QUEUEING NETWORK MODELS. THESE CORRESPOND TO THE NOTIONS OF OPEN AND CLOSE CLASSES, AN OPEN CLASS BEING ONE IN WHICH CUSTOMERS MAY ARRIVE AND DEPART THE MODEL, AND A CLOSE CLASS BEING ONE IN WHICH THE NUMBER OF CUSTOMERS IS FIXED. THIS PAPER EXAMINES THE EFFECTS ON MEAN SYSTEM PERFORMANCE MEASURES OF THE WORKLOAD REPRESENTATION CHOSEN. OPEN AND CLOSED REPRESENTATIONS ARE COMPARED UNDER THE EQUIVALENCY CONSTRAINTS THAT THEY RESULT IN IDENTICAL SYSTEM THROUGHPUT OR MEAN SYSTEM POPULATION LEVEL FOR THE CLASS BEING CONSIDERED. IT IS SHOWN FORMALLY FOR A LIMITED CLASS OF NETWORKS THAT THE OPEN REPRESENTATION RESULTS IN LARGER SYSTEM RESPONSE TIMES THAN EQUIVALENT CLOSED REPRESENTATIONS, AND THAT ONE OF THE CLOSED REPRESENTATIONS RESULTS IN THE SMALLEST SYSTEM RESPONSE TIME OF THOSE CONSIDERED. EXTENSIVE NUMERICAL RESULTS SHOW FOR A MORE GENERAL CLASS OF MODELS THAT THERE IS A STRICT ORDERING (IN TERMS OF SYSTEM RESPONSE TIME) OF THE NATURAL CLASS REPRESENTATIONS CONSIDERED. THESE RESULTS CAN BE USED IN AT LEAST TWO WAYS. ONE IS TO GUIDE THE INITIAL REPRESENTATION OF COMPUTER SYSTEM WORKLOADS IN PERFORMANCE MODELS. THE OTHER APPLICATION IS AS A COMPONENT OF APPROXIMATE ANALYSIS TECHNIQUES FOR QUEUEING MODELS THAT DECOMPOSE INDIVIDUAL NETWORKS INTO MULTIPLE SUBMODELS, EACH OF WHICH IS THEN SOLVED IN ISOLATION. HERE THE GOAL IS TO REPRESENT CUSTOMER CLASSES IN EACH SUBMODEL IN A WAY THAT IS CONVENIENT COMPUTATIONALLY, AND THAT RESULTS IN

PERFORMANCE MEASURES CLOSELY MATCHING THOSE OBSERVED IN THE FULL NETWORK. IT IS THIS LATTER APPLICATION THAT WE ASSUME IN THIS PAPER. AN EXAMPLE OF THE APPLICATION OF OUR RESULTS TO AN EXISTING APPROXIMATION TECHNIQUE IS GIVEN.

KEYWORDS:

QUEUEING NETWORK MODELS * NETWORK MODELING * PERFORMANCE EVALUATION * NETWORK * QUEUEING THEORY * WORKLOAD REPRESENTATION

CATEGORIES:

3.72 * 5 * 5.13 * 5.5 * 8.1

REFERENCE CODE: 154

JOURNAL:

PROCEEDINGS OF THE 1983 ACM SIGMETRICS CONFERENCE ON MEASUREMENT AND MODELING OF COMPUTER SYSTEMS (PERFORMANCE EVALUATION REVIEW)

DATE: AUGUST 1983

PAGES: 130 - 137

TITLE:

AN OPERATIONAL VIEW ON RENEWAL THEORY

AUTHOR(s):

KOWALK, WOLFGANG

AFFILIATION:

FACHBEREICH INFORMATIK DER UNIVERSITÄT HAMBURG, WEST GERMANY

ABSTRACT:

IN THIS PAPER WE DERIVE A FORMULA FOR THE MOMENTS OF THE RESIDUAL LIFE IN OPERATIONAL CONTEXT, AND SHOW THAT THE PARADOX OF RESIDUAL LIFE HOLDS ALSO IN A FINITE QUEUEING MODEL. IN ADDITION, WE PROVE THE RENEWAL THEOREM, SHOW THAT FORWARD AND BACKWARD TIMES ARE INDEPENDENT, AND STATE THE MEMORYLESS PROPERTY. AS APPLICATIONS WE POINT OUT HOW TO DERIVE TAKACS RECURRENCE FORMULA FOR THE MOMENTS OF THE WAITING TIME AND HOW TO BASE THE MARKOVIAN STATE THEORY ON THIS.

KEYWORDS:

RENEWAL THEORY * QUEUEING MODEL * MARKOVIAN THEORY

CATEGORIES:

5 * 5.5 * 8.3

REFERENCE CODE: 155

JOURNAL:
PROCEEDINGS OF THE 1983 ACM SIGMETRICS CONFERENCE ON
MEASUREMENT AND MODELING OF COMPUTER SYSTEMS (PERFORMANCE
EVALUATION REVIEW)
DATE: AUGUST 1983
PAGES: 138 - 150

TITLE:
CONSTRUCTION OF VALIDATED SIMULATOR FOR PERFORMANCE
PREDICTION OF DECNET-BASED COMPUTER NETWORKS

AUTHOR(s):
WOLFINGER, BERND * MUHLHAUSER, MAX

AFFILIATION:
FACHBEREICH INFORMATIK, UNIVERSITAT HAMBURG * INSTITUT FUR
INFORMATIK III, UNIVERSITAT KARLSRUHE

ABSTRACT:
PREDICTING IMPORTANT PERFORMANCE PARAMETERS OF COMPUTER
NETWORKS, RECOGNIZ- ING POTENTIAL BOTTLENECKS, COMPARING
DESIGN ALTERNATIVES ARE FACTORS OF DECISIVE IMPORTANCE IN
BUILDING COMPLEX COMPUTER NETWORKS. IN THIS RESPECT,
COMPUTER AIDED SIMULATION HAS PROVED TO BE A VERY EFFECTIVE
DESIGN TOOL IN A NUMBER OF PRACTICAL APPLICATIONS. IT IS
SHOWN BY THE EXAMPLE OF THE MOSAIC MODELING SYSTEM HOW A
SIMULATOR APPLICABLE ON A BROAD BASIS COULD BE ADAPTED TO
THE SPECIFIC CHARACTERISTICS OF A CLASS OF EXISTING COMPUTER
NETWORKS. THE CLASS OF COMPUTER NETWORKS CHOSEN FOR MODELING
IS BASED ON DECNET COMMUNICATION SOFTWARE. MODELING
CONCENTRATES MAINLY ON THE DECNET PROTOCOLS AND THEIR
HIERARCHIES. THE PAPER INDICATES THE ADAPTATIONS NECESSARY
TO ADJUST THE MOSAIC KERNEL SYSTEM ADEQUATELY TO DECNET
COMPUTER NETWORKS AND SUMMARIZES THE RESULTS OF A RATHER
EXTENSIVE VALIDATION FOR THE MODELING SYSTEM, COMPRISING
CALIBRATION AND ACCURACY ESTABLISHMENT, WHICH HAS BEEN
CARRIED OUT SUCCESSFULLY.

KEYWORDS:
SIMULATION * COMPUTER NETWORK ARCHITECTURES * COMMUNICATION
PROTOCOLS * PROTOCOL HIERARCHIES * PERFORMANCE EVALUATION *
MODELING SYSTEMS * VALIDATION

CATEGORIES:
3.72 * 3.81 * 5.5 * 8.1

REFERENCE CODE: 156

JOURNAL:
PROCEEDINGS OF THE 1983 ACM SIGMETRICS CONFERENCE ON

MEASUREMENT AND MODELING OF COMPUTER SYSTEMS (PERFORMANCE
EVALUATION REVIEW)

DATE: AUGUST 1983

PAGES: 200 - 206

TITLE:

A PERFORMANCE EVALUATION OF THE MULTIPLE BUS NETWORK FOR
MULTIPROCESSOR SYSTEMS

AUTHOR(s):

VALERO, MATEO * LLABERIA, JOSE M. * LLBARTA, JESUS

AFFILIATION:

FACULTAD INFORMATICA, BARCELONA, SPAIN * E.T.S.I.

TELECOMUNICACION, BARCELONA, SPAIN * UCLA, CALIFORNIA, USA

ABSTRACT:

IN THIS PAPER WE PRESENT A MATHEMATICAL MODEL TO COMPUTE THE
BANDWIDTH OF THE MULTIPLE BUS INTERCONNECTION NETWORK. DUE
TO THE COMPUTATIONAL COMPLEXITY ASSOCIATED WITH THE EXACT
SOLUTION, THE PROCESSORS ARE REMOVED FROM THE QUEUES AT THE
END OF EACH MEMORY CYCLE TO FACILITATE THE ANALYSIS. THIS
LEADS TO APPROXIMATE SOLUTIONS WHICH ARE BOTH EASIER TO
OBTAIN AND VERY ACCURATE.

KEYWORDS:

PERFORMANCE EVALUATION * BUS NETWORK * MULTIPROCESSOR *
MATHEMATICAL MODEL * QUEUEING MODELS * NETWORK * BANDWIDTH

CATEGORIES:

3.72 * 4.32 * 5.5

REFERENCE CODE: 157

JOURNAL:

DATA BASE * SIGMOD RECORD * DATA BASE DIRECTIONS

DATE: DECEMBER 1976 * NOVEMBER 1976 * OCTOBER 1975

PAGES: 79 - 103

TITLE:

DATA BASE TECHNOLOGY — PRESENT AND FUTURE WORKING PANEL
REPORT ON EVOLVING TECHNOLOGY

AUTHOR(s):

DODD, GEORGE

AFFILIATION:

COMPUTER SCIENCE DEPARTMENT OF GENERAL MOTORS RESEARCH
LABORATORY

ABSTRACT:

THE CHAPTER OF THIS PANEL WAS TO EXAMINE THE EVOLUTION OF TECHNOLOGY AS IT AFFECTS DATA BASE MANAGEMENT SYSTEMS (DBMS). IN PARTICULAR, THE PANEL MEMBERS WERE INSTRUCTED TO EXAMINE THE TECHNICAL AREAS DISCUSSED HEREIN AND TO PREPARE RECOMMENDATIONS ON HOW THE MANAGER OF A COMPUTER INSTALLATION SHOULD REACT CONCERNING THE DEVELOPMENT OF DATA BASE SYSTEMS OVER THE NEXT FIVE YEARS. IN ADDITION, THE PANEL EXAMINED THE DIRECTIONS OF TECHNOLOGICAL EVOLUTION OVER THE NEXT TEN YEARS AND SUMMARIZED THE WORK TO BE UNDERTAKEN TO ACHIEVE REASONABLE PROGRESS. THIS PANEL INCLUDED MEMBERS FROM THE USER COMMUNITY, ACADEMIA, CODASYL, MANUFACTURERS OF COMPUTER EQUIPMENT AND INDUSTRIAL FIRMS. THIS SPECTRUM PROVIDED A BROAD VIEW OF THE OVERALL DIRECTIONS WE EXPECT DATA BASE MANAGEMENT SYSTEMS TO TAKE. FOUR CATEGORIES OF TOPICS WERE DISCUSSED. THEY ARE: (1) USABILITY WHICH INCLUDES DATA BASE SPECIFICATION, USE OF PROGRAMMING AIDS, DATA BASE TUNING, AVAILABILITY OF DATA BASES, ERROR RECOVERY AND DATA INDEPENDENCE; (2) DATA BASE ARCHITECTURE AND DISTRIBUTED DATA BASE SYSTEMS; (3) NEW FUNCTIONS WHICH INCLUDE DATA BASE MODELS, RELATIONAL INFERENCES, NATURAL LANGUAGES AND DATA BASE SEMANTICS; AND (4) MISCELLANEOUS WHICH COVERS STANDARDIZATION AND RESEARCH FINANCING.

KEYWORDS:

DATABASE * PROGRAMMING AIDS * DBMS * DATABASE ARCHITECTURE * TECHNOLOGICAL EVOLUTION * TUNING

CATEGORIES:

2.2 * 2.4 * 3.51 * 3.7 * 4.2 * 4.33

REFERENCE CODE: 158

JOURNAL:

SIGIR PROCEEDINGS, SIGIR 1978 INTERNATIONAL CONFERENCE ON INFORMATION STORAGE AND RETRIEVAL PROCEEDINGS

VOLUME: 13

ISSUE: 1

DATE: JUNE 1978

PAGES: 151 - 169

TITLE:

DOES RELEVANCE FEEDBACK IMPROVE DOCUMENT RETRIEVAL PERFORMANCE?

AUTHOR(s):

WILLIAMSON, ROBERT E.

AFFILIATION:

INFORMATICS, INC.

ABSTRACT:

MANY AUTHORS HAVE SUGGESTED THAT OVERALL PERFORMANCE OF A DOCUMENT RETRIEVAL SYSTEM IS IMPROVED BY RELEVANCE FEEDBACK. RELEVANCE FEEDBACK DENOTES THE LAST THREE STEPS IN THE FOLLOWING PROCESS: (1) THE SEARCHER ENTERS A QUERY (2) THE SYSTEM PREPARES A RANKED LIST OF SUGGESTED DOCUMENTS, (3) THE SEARCHER JUDGES SOME OF THE DOCUMENTS FOR RELEVANCY, (4) THE SEARCHER INFORMS THE SYSTEM OF THESE DOCUMENTS JUDGED AND OF THE JUDGMENT, (5) THE SYSTEM CONSTRUCTS A NEW QUERY BASED ON THE DESCRIPTORS USED IN THE ORIGINAL QUERY AND THE DESCRIPTORS USED IN THE DOCUMENTS JUDGED, (6) THE SYSTEM PREPARES A SECOND RANKED LIST OF SUGGESTED DOCUMENTS. THE PRESUMPTION IS THAT THE SECOND LIST IS BETTER THAN THE FIRST. BY ALL PERFORMANCE MEASURES (E.G. "FLUID RANKING" AND "FROZEN RANKING"), THE SECOND LIST IS BETTER THAN THE FIRST. HOWEVER, IF ONE RERANKS DOCUMENTS IN THE ORIGINAL LIST SO AS TO REFLECT THE SEARCHER'S EFFORTS (STEP 3), THE CORRESPONDING PERFORMANCE MEASURES ARE COMPARABLE TO THOSE FOR THE SECOND LIST. THE MARGINAL DIFFERENCE BETWEEN THE PERFORMANCE MEASURES FOR THE "RERANKED ORIGINAL" LIST (SEARCHER'S EFFORTS ALONE) AND THE SECOND LIST (WHICH INCLUDES COMPUTER EFFORTS) MAKES IT UNCLEAR IF THE COST OF STEP 4 THROUGH 6 ABOVE CAN BE JUSTIFIED. IT IS HOPED THAT ADVOCATES OF RELEVANCE FEEDBACK WILL PRESENT "RERANKED ORIGINAL" PERFORMANCE MEASURES AS A BASIS FOR ANY PERFORMANCE IMPROVEMENT CLAIMS. THIS PAPER ALSO PRESENTS THREE REASONABLE, EASILY UNDERSTOOD RETRIEVAL PROCEDURES FOR WHICH THE FROZEN RANKING, THE FLUID RANKING, AND THE RERANKED ORIGINAL EVALUATIONS ARE "OBVIOUSLY" THE PERTINENT WAY TO EVALUATE. RELEVANCE FEEDBACK TECHNIQUES AS IMPLEMENTED IN SALTON'S SMART DRS APPEAR TO SHOW THAT IT IS WORTHWHILE FOR USER'S TO READ ABSTRACTS PRIOR TO EVALUATION OF FULL TEXTS. THE LAST INDICATION PRESENTED IN THIS PAPER IS THAT THE RELEVANCE FEEDBACK PERFORMANCE IMPROVEMENTS NOTED USING SMART ARE DUE MOSTLY TO THE USER MAKING ASSESSMENTS; SUBSEQUENT COMPUTER EFFORTS APPEAR TO BE MOST LIKELY TO RESULT IN NO FURTHER CHANGE. FOR A QUERY FOR WHICH THERE IS A SUBSEQUENT CHANGE, THE CHANGE IS AS LIKELY TO BE HARMFUL AS HELPFUL.

KEYWORDS:

INFORMATION RETRIEVAL * PERFORMANCE EVALUATION * FEEDBACK
TECHNIQUES * SEARCHING

CATEGORIES:

3.74 * 4.6 * 5.6

REFERENCE CODE: 159

JOURNAL:

THE FOURTH INTERNATIONAL CONFERENCE ON INFORMATION STORAGE
AND RETRIEVAL

VOLUME: 16
ISSUE: 1
DATE: JUNE 1981
PAGES: 15 - 21

TITLE:
RESTRICTED EVALUATION IN INFORMATION RETRIEVAL

AUTHOR(s):
BOLLMANN, P. * BHERNIAVSKY, V. S.

AFFILIATION:
TECHNISCHE UNIVERSITAT BERLIN * TECHNISCHE UNIVERSITAT
BRAUNSCHWEIG

ABSTRACT:
ONE OF THE CENTRAL PROBLEMS CONNECTED WITH MEASURING IN INFORMATION RETRIEVAL IS THE PROBLEM TO SELECT ONE OF NUMEROUS MEASURES PROPOSED FOR EVALUATING PERFORMANCE OF INFORMATION RETRIEVAL SYSTEMS. IN ORDER TO SELECT A MEASURE WE HAVE TO KNOW ITS PROPERTIES AND WE HAVE TO BE ABLE TO COMPARE IT WITH OTHER MEASURES. THIS IN TURN BRINGS US TO THE NECESSITY TO DESCRIBE MEASURES IN SOME PRECISE AND OPERATIONAL WAY. MEASURES APPLIED TO EVALUATE SYSTEMS ARE IN FACT DIRECTLY APPLICABLE NOT TO SYSTEMS BUT RATHER TO THEIR OUTPUTS. HENCE PROPERTIES OF SOME MEASURE ARE ALWAYS PROPERTIES EXHIBITED IN MEASURING SETS OF RETRIEVAL OUTPUTS AND DEPEND ON HOW THESE SETS ARE SELECTED. THE FOLLOWING TWO APPROACHES ARE POSSIBLE HERE: WITH THE FIRST ONE WE DO NOT LIMIT THE RETRIEVAL OUTPUTS WHEN APPLYING THE MEASURE. WITHIN THE SECOND APPROACH ONLY THOSE RETRIEVAL OUTPUTS ARE PERMITTED WHICH FULFIL SPECIFIC RESTRICTING REQUIREMENTS. IN THIS PAPER WE APPROACH THE PROBLEM OF HOW PROPERTIES AND MUTUAL RELATIONS OF PERFORMANCE MEASURES ARE AFFECTED BY REPLACING THE UNRESTRICTED MEASUREMENT APPROACH BY A RESTRICTED ONE. WE ESTABLISH A MATHEMATICAL MODEL DESCRIBING THE COMPARABILITY OF RETRIEVAL OUTPUTS. WE MAKE THE ASSUMPTION THAT COMPARABILITY IS REFLEXIVE, SYMMETRIC AND TRANSITIVE. THUS COMPARABILITY DEFINES AN EQUIVALENCE RELATION ON THE SET OF ALL RETRIEVAL OUTPUTS. THESE EQUIVALENCE RELATIONS DESCRIBE UNAMBIGUOUSLY THE CORRESPONDING EVALUATION RESTRICTIONS. THE FOLLOWING SPECIFIC RESTRICTIONS ARE INVESTIGATED: (1) ONLY RETRIEVAL OUTPUTS HAVING THE SAME GENERALITY ARE COMPARABLE. (2) ONLY RETRIEVAL OUTPUTS HAVING BOTH THE SAME NUMBER OF RELEVANT AS WELL AS THE SAME NUMBER OF NON-RELEVANT DOCUMENTS ARE COMPARABLE, (3) ONLY RETRIEVAL OUTPUTS HAVING BOTH THE SAME NUMBER OF RELEVANT AS WELL AS THE SAME NUMBER OF NON-RELEVANT DOCUMENTS AND IN ADDITION HAVING THE SAME NUMBER OF DOCUMENTS IN EACH RANK ARE COMPARABLE. IT IS SHOWN THAT RESTRICTING THE COMPARABILITY DEFINES A HOMOMORPHISM ON THE MEASURES WITH RESPECT TO THEIR HIERARCHY. FINALLY THE SO-CALLED MICRO- EVALUATION IS DESCRIBED AND ANALYZED FROM

THE VIEW POINT OF RESTRICTED EVALUATION.

KEYWORDS:

INFORMATION RETRIEVAL * PERFORMANCE EVALUATION *
MATHEMATICAL MODEL

CATEGORIES:

3.72 * 4.6 * 5.5

REFERENCE CODE: 160

JOURNAL:

PROCEEDINGS OF THE FOURTH INTERNATIONAL CONFERENCE ON
INFORMATION STORAGE AND RETRIEVAL

VOLUME: 16

ISSUE: 1

DATE: JUNE 1981

PAGES: 66 - 71

TITLE:

SIMULATION OF USER JUDGMENTS IN BIBLIOGRAPHIC RETRIEVAL
SYSTEMS

AUTHOR(s):

TAGUE, JEAN M. * NELSON, MICHAEL J.

AFFILIATION:

UNIVERSITY OF WESTERN ONTARIO, LONDON, ONTARIO, CANADA

ABSTRACT:

THE GENERAL MODEL AND SIMULATION ALGORITHMS FOR
BIBLIOGRAPHIC RETRIEVAL SYSTEMS PRESENTED IN AN EARLIER
PAPER ARE EXPANDED. THE NEW MODEL INTEGRATES THE PHYSICAL AS
WELL AS THE LOGICAL AND SEMANTIC ELEMENTS OF THESE SYSTEMS.
A MODIFIED ALGORITHM IS DEVELOPED FOR THE SIMULATION OF USER
RELEVANCE JUDGMENT, AND IS VALIDATED, BY MEANS OF
RECALL-PRECISION CURVES AND A KOLMOGOROV-SMIRNOV TEST OF
RECALL, FOR TWO TEST COLLECTIONS. OTHER APPROACHES TO
GOODNESS-OF-FIT TESTING ARE SUGGESTED.

KEYWORDS:

SIMULATION * INFORMATION RETRIEVAL * BIBLIOGRAPHIC RETRIEVAL
* MODELS

CATEGORIES:

5.5 * 8.1

REFERENCE CODE: 161

JOURNAL:
PROCEEDINGS OF THE FOURTH INTERNATIONAL CONFERENCE ON
INFORMATION STORAGE AND RETRIEVAL
VOLUME: 16
ISSUE: 1
DATE: JUNE 1981
PAGES: 126 - 129

TITLE:
CONTENT ANALYSIS AS A WORD-PROCESSING OPTION

AUTHOR(s):
CARROLL, JOHN M.

AFFILIATION:
UNIVERSITY OF WESTERN ONTARIO, LONDON, CANADA

ABSTRACT:
A SIMPLE CONTENT-ANALYSIS PROGRAM INCORPORATED IN A
WORD-PROCESSING SYSTEM CAN DISPLAY THE MOST SIGNIFICANT
SENTENCE OF A PAGE OF TEXT AND GIVE A SHORT LIST OF THE MORE
IMPORTANT WORDS. THIS COULD HELP AUTHORS WRITE TITLES,
SUMMARIES, AND DESCRIPTOR LISTS. THE CONTENT-ANALYSIS
PROGRAM RELIES ON WORD FREQUENCY, PRECEDENCE, AND
CO-OCCURRENCE AS INDICATORS OF CONTENT SIGNIFICANCE. TEST
SHOW IT PERFORMS AT LEAST AS WELL AS SOME TRAINED INDEXERS.

KEYWORDS:
CONTENT ANALYSIS * WORD PROCESSING

CATEGORIES:
3.71

REFERENCE CODE: 162

JOURNAL:
PROCEEDINGS OF THE FOURTH INTERNATIONAL CONFERENCE ON
INFORMATION STORAGE AND RETRIEVAL
VOLUME: 16
ISSUE: 1
DATE: JUNE 1981
PAGES: 132 - 144

TITLE:
OUTLINE OF A DYNAMIC SELF-TUNING AND ADAPTIVE INFORMATION
RETRIEVAL SYSTEM

AUTHOR(s):
HAUSEN, HANS-LUDWIG

AFFILIATION:

INSTITUT FUR SOFTWARE - TECHNOLOGIE, GESELLSCHAFT FUR
MATHEMATIK UND DATENVERARBEITUNG, GERMANY

ABSTRACT:

A SELF-TUNING ADAPTIVE INFORMATION RETRIEVAL SYSTEM AS AN
EXTENSION OF THE CONCEPT OF A "CLASSICAL" DOCUMENT RETRIEVAL
SYSTEM, IS OUTLINED. THIS SYSTEM ACCEPTS DOCUMENTS AND
SEARCH REQUESTS IN NATURAL LANGUAGE, AS WELL AS THE
SYSTEM-PROPOSALS PREVIOUSLY PRODUCED BY THE SYSTEM ITSELF OR
PRE- PARED BY THE SYSTEM OPERATOR. IT PRODUCES A
SYSTEM-PROPOSAL THAT CONSISTS OF A LIST OF DOCUMENTS RANKED
ACCORDING TO THEIR RELEVANCE TO THE QUERY. INCORPORATED INTO
THE SYSTEM IS A SYSTEM VALUATION SUBSYSTEM THAT USES
WEIGHTED RELEVANCE JUDGMENTS. THIS SUBSYSTEM GIVES AS OUTPUT
AN EFFECTIVE- NESS VALUE AND AN EFFICIENCY VALUE: BOTH
TOGETHER MEASURE THE QUALITY OF AN INFORMATION RETRIEVAL
SYSTEM. THE COMPUTATION OF THE QUALITY VALUES AND THE VALUES
THEMSELVES ARE INDEPENDENT OF A SPECIFIC IMPLEMENTATION. THE
RETRIE- VAL PROCESS IN THIS SYSTEM CONSISTS OF TWO PARTS,
NAMELY A QUERY-DOCUMENT MATCH AND A QUERY-QUERY MATCH.

KEYWORDS:

DOCUMENT RETRIEVAL * SYSTEM EVALUATION * DOCUMENT QUERY
CORRELATION * QUERY CORRELATION

CATEGORIES:

3.72 * 4.2

REFERENCE CODE: 163

JOURNAL:

COMPUTER MANAGEMENT

DATE: MAY 1983

PAGES: 25 - 28

TITLE:

DATA MANAGEMENT

AUTHOR(s):

MANCHESTER, P.

ABSTRACT:

THE POWER OF DATA DEPENDS VERY MUCH ON HOW IT HAS BEEN
STORED. THE AUTHOR REPORTS ON THE LATEST TECHNIQUES OF
ORGANIZING INFORMATION

REFERENCE CODE: 164

JOURNAL:

COMPUTING & ELECTRICAL ENGINEERING

VOLUME: 10

ISSUE: 1

DATE: 1983

PAGES: 3 - 9

TITLE:

A COMPARISON OF PROCESSING TIMES FOR UPDATE REQUESTS IN TWO
LOCKING SCHEMES

AUTHOR(s):

FUNG, K.T. * LAM, C.M.

AFFILIATION:

AMERICAN BELL

ABSTRACT:

MODELS ARE DEVELOPED FOR THE PRIMARY SITE AND THE PRIMARY
COPY LOCKING SCHEMES FOR CONCURRENCY CONTROL IN DISTRIBUTED
DATABASES. THESE MODELS ARE THEN ANALYZES TO OBTAIN ANALYTIC
RESULTS, WHICH ENABLE ONE TO CONVENIENTLY MAKE COMPARISONS
OF TWO LOCKING SCHEMES IN TERMS OF THEIR PROCESSING TIMES
FOR UPDATE REQUESTS AS WELL AS OTHER DESIGN DECISIONS. THE
ANALYSIS FOLLOWS AN APPROACH BASED ON A SYSTEMATIC
ASSIGNMENT OF COMPARABLE VALUES TO CORRESPONDING PARAMETERS
IN THE TWO MODELS.

REFERENCE CODE: 165

JOURNAL:

AFIPS, NCC

DATE: MAY 1983

PAGES: 395 - 401

TITLE:

ISSUES IN THE DESIGN OF RELATIONAL MODEL MANAGEMENT SYSTEMS

AUTHOR(s):

BLANNING, R. W.

AFFILIATION:

VANDERBILT UNIVERSITY

ABSTRACT:

ONE COMPONENT OF THE LITERATURE ON MODEL MANAGEMENT IN
DECISION SUPPORT SYSTEMS (DSSs) SUGGESTS THAT THE RELATIONAL
FRAMEWORK FOR DATA MANAGEMENT BE EXTENDED TO THE MANAGEMENT
OF DECISION MODELS. THE AUTHOR EXAMINES THESE IMPORTANT
DESIGN ISSUES IN RELATIONAL MODEL MANAGEMENT, THE ORGANIZA-
TION OF RELATIONAL MODEL BANKS, RELATIONAL COMPLETENESS OF
MODEL QUERY LAN- GUAGES, AND SYSTEM IMPLEMENTATIONS.

REFERENCE CODE: 166

JOURNAL:

ACM IEEE 20TH DESIGN AUTOMATION CONFERENCE PROCEEDINGS

DATE: JUNE 1983

PAGES: 599 - 607

TITLE:

TUTORIAL: THE RELATIONAL DATA MODEL FOR DESIGN AUTOMATION

AUTHOR(s):

HAYNIE, M. N.

AFFILIATION:

AMDAHL CORPORATION

ABSTRACT:

THE RELATIONAL DATA MODEL HAS GAINED MORE ACCEPTANCE IN THE COMMERCIAL DATABASE ENVIRONMENT IN RECENT YEARS. IT IS NOW FINDING ITS WAY INTO THE DESIGN AUTOMATION (CAD/CAM) AREA. THE AUTHOR EXPLAINS WHAT THE RELATIONAL DATA MODEL IS AND HOW DATABASE MANAGEMENT SYSTEMS BASED ON IT CAN BE USED WITH DESIGN AUTOMATION APPLICATIONS.

REFERENCE CODE: 167

JOURNAL:

INFOSYSTEMS

VOLUME: 29

ISSUE: 9

DATE: SEPTEMBER 1982

PAGES: 52 - 58

TITLE:

RELATIONAL DBMS: WHAT'S IN A NAME

AUTHOR(s):

THIEL C.T.

ABSTRACT:

THE IMPORTANT THING ABOUT RELATIONAL SYSTEMS IS THAT THEY ALLOW USERS TO DYNAMICALLY CHANGE ASSOCIATIONS IN FILES TO SUIT THEIR OWN PURPOSES WITHIN THE CONFINES OF WHAT THEY ARE AUTHORIZED TO ACCESS.

REFERENCE CODE: 168

JOURNAL:
SMALL SYSTEMS WORLD
VOLUME: 10
ISSUE: 10
DATE: OCTOBER 1982
PAGES: 2 - 8

TITLE:
TAKING THE RIGHT PATH TO DBMS

AUTHOR(s):
PERRY, W. E.

ABSTRACT:
METHODS FOR ESTABLISHING DATABASE OBJECTIVES ARE GIVEN.
VARIOUS STRATEGIES ARE THEN DISCUSSED FOR THE DEVELOPMENT OF
A PROPOSED DATABASE.

REFERENCE CODE: 169

JOURNAL:
COMPUTERWORLD
VOLUME: 16
ISSUE: 43
DATE: OCTOBER 1982

TITLE:
SPECIAL REPORT: DATABASE MANAGEMENT SYSTEMS

AUTHOR(s):
PAUL, W. E.

ABSTRACT:
THIS REPORT COVERS ALL ASPECTS OF DATABASE MANAGEMENT
SYSTEMS. MANY APPLICATIONS OF THESE SYSTEMS ARE DESCRIBED AS
WELL AS POSSIBLE DEVELOPMENTS FOR DATABASE MANAGEMENT
SYSTEMS IN THE FUTURE.

REFERENCE CODE: 170

JOURNAL:
CACM
VOLUME: 29
ISSUE: 9
DATE: SEPTEMBER 1982
PAGES: 600 - 604

TITLE:

DESIGNING A BLOOM FILTER FOR DEFFERENTIAL FILE ACCESS

AUTHOR(s):
GREMILLION, L. L.

AFFILIATION:
INDIANA UNIVERSITY

ABSTRACT:
THE USE OF A DIFFERENTIAL FILE FOR A DATABASE UPDATE CAN YIELD INTEGRITY AND PERFORMANCE BENEFITS, BUT IT CAN ALSO PRESENT PROBLEMS IN PROVIDING CURRENT DATA TO SUBSEQUENT ACCESSING TRANSACTIONS. A MECHANISM KNOWN AS BLOOM FILTER CAN SOLVE THESE PROBLEMS BY PREVENTING MOST UNNECESSARY SEARCHES OF THE DIFFERENTIAL FILE. THE DESIGN PROCESS FOR AN ONLINE STUDENT DATABASE IS DESCRIBED, AND IS SHOWN THAT A VERY EFFECTIVE FILTER CAN BE CONSTRUCTED WITH A MODEST EXPENDITURE OF SYSTEM RESOURCES.

REFERENCE CODE: 171

JOURNAL:
CYBERNETICS
VOLUME: 17
ISSUE: 6
DATE: NOVEMBER 1981
PAGES: 21 - 30

TITLE:
AUTOMATED DESIGN OF INFORMATION SYSTEMS

AUTHOR(s):
TELENIK, S. F.

ABSTRACT:
USES THE MULTILEVEL APPROACH TO ANALYZE THE DESIGN OF DATA BASE (DB) STRUCTURES IN THE SPACE OF ACCESS PATHS FOR HIERARCHICAL DATA-BASE MANAGEMENT SYSTEMS (DBMS). THE RESULTS OBTAINED CAN BE FUTHER APPLIED TO CHOOSE STOR- AGE STRUCTURES AND DB ALLOCATION TO COMPUTER STORAGE DEVICES.

REFERENCE CODE: 172

JOURNAL:
JASIS
VOLUME: 33
ISSUE: 5
DATE: SEPTEMBER 1982
PAGES: 308 - 310

TITLE:
ASSOCIATIVE SEARCH TECHNIQUES VERSUS PROBABILISTIC RETRIEVAL
MODELS

AUTHOR(s):
MARON M. E.

AFFILIATION:
UNIVERSITY OF CALIFORNIA

ABSTRACT:
THIS ARTICLE OFFERS A PERSONAL LOOK BACK AT THE ORIGINS AND
EARLY USE OF ASSOCIATIVE SEARCH TECHNIQUES AND ALSO LOOK
FORWARD AT MORE THEORETICAL APPROACHES TO THE DOCUMENT
RETRIEVAL PROBLEMS. THE PURPOSE IS TO CONTRAST THE FOLLOWING
TWO WAYS OF IMPROVING SYSTEMS PERFORMANCE:(1) APPENDING
ASSOCIATIVE SEARCH TECHNIQUES TO LESS OR MORE STANDARD
(CONVENTIONAL) DOCUMENT RETRIEVAL SYSTEMS, AND (2)DESIGNING
DOCUMENT RETRIEVAL SYSTEMS BASED ON MORE FUNDAMENTAL AND
APPROPRIATE PRINCIPLES NAMELY PROBABILISTIC DESIGN PRIN-
CIPLES. VERY RECENT WORK ON PROBABILISTIC APPROACHES TO THE
DOCUMENT RETRIEVAL PROBLEM HAS PROVIDED A NEW AND RARE
UNIFICATION OF TWO PREVIOUSLY COMPETING MODELS. IN LIGHT OF
THIS, THE AUTHORS ARGUE THAT IF ONE HAD TO CHOOSE THE BEST
WAY TO IMPROVE PERFORMANCE OF A DOCUMENT RETRIEVAL SYSTEM,
IT WOULD BE WISER TO IMPLEMENT, TEST AND EVALUATE THIS NEW
UNIFIED MODEL, RATHER THAN TO CONTINUE TO USE ASSOCIATIVE
TECHNIQUES WHICH ARE COUPLED TO CONVENTIONALLY DESIGNED
RETRIEVAL SYSTEMS.

REFERENCE CODE: 173

JOURNAL:
JASIS
VOLUME: 33
ISSUE: 5
DATE: SEPTEMBER 1982
PAGES: 325 - 332

TITLE:
A COMPUTER INTERMEDIARY FOR INTERACTIVE DATABASE SEARCHING.
I. DESIGN

AUTHOR(s):
MEADOW, C. T. * HEWETT T. T. * AVERSA E. S.

AFFILIATION:
DREXEL UNIVERSITY

ABSTRACT:

THIS IS THE FIRST OF TWO ARTICLES THAT REPORT ON THE DEVELOPMENT, TESTING, AND EVALUATION OF THE INDIVIDUALIZED INSTRUCTION FOR DATA ACCESS SYSTEMS (IIDA). IIDA IS AN EXAMPLE OF A CLASS OF COMPUTER SYSTEMS WHICH SERVE AS INTERMEDIARIES, ENABLING THEIR USERS TO PERFORM A COMPLEX TASK ON ANOTHER COMPUTER , AND WHICH ARE COMING TO BE KNOWN AS EXPERT SYSTEMS. THE SYSTEM WAS DESIGNED TO ENCOURAGE END USERS OF INFORMATION RETRIEVAL SYSTEMS TO PERFORM THEIR OWN SEARCHES BY (1) INSTRUCTING THEM IN HOW TO SEARCH, USING COMPUTER-ASSISTED INSTRUCTION AND (2) ASSISTING WITH THE PERFORMANCE OF THE SEARCH BY PROVIDING DIAGNOSTIC ANALYSES OF THE USERS' PERFORMANCE AS WELL AS ANSWERING THEIR QUESTIONS ABOUT HOW TO USE SYSTEM COMMANDS. THE SYSTEM'S DESIGN IS DESCRIBED, AS WELL AS THE VARIOUS TEST OF ITS PERFORMANCE AND THE EVALUATION OF TEST RESULTS. THE CONCLUSION IS DRAWN THAT END USERS CAN BECOME SUCCESSFUL SEARCHES THROUGH SUCH AN ASSISTANT, FOR THE KINDS OF SEARCHES TESTED.

REFERENCE CODE: 174

JOURNAL:
ASLIB (GB)
VOLUME: 34
ISSUE: 9
DATE: SEPTEMBER 1982
PAGES: 394 - 405

TITLE:
LANGUAGE AND INFORMATION RETRIEVAL IN SOCIAL SCIENCES

AUTHOR(s):
ADAM, R. A.

AFFILIATION:
CITY UNIVERSITY

ABSTRACT:
DISCUSSES WAYS IN WHICH SOCIAL SCIENTISTS USE LANGUAGE, IN BOTH NATURAL AND TECHNICAL FORMS, AND DESCRIBES SOME OF THE RESULTANT COMMUNICATION PROBLEMS THAT RELATE TO THE DEVELOPMENT OF INFORMATION SERVICES. IT IS IMPORTANT THAT SUCH DEVICES SHOULD BE MATCHED TO THE STRUCTURE OF KNOWLEDGE WITHIN THE RELEVANT DISCIPLINES SO THAT THEY CAN CONTRIBUTE EFFECTIVELY TO CREATION OF NEW KNOWLEDGE. IN ORDER FOR THIS TO BE ACHIEVED, SERVICE PROVIDERS MUST UNDER- STAND THE LANGUAGE OF THEIR USERS.

REFERENCE CODE: 175

JOURNAL:
BELL SYST. TECH. J.
VOLUME: 62
ISSUE: 6
DATE: JULY 1983
PAGES: 1753 - 1806

TITLE:
HUMAN FACTORS AND BEHAVIORAL SCIENCE: STATISTICAL SEMANTICS:
ANALYSIS OF THE POTENTIAL PERFORMANCE OF KEY-WORD
INFORMATION SYSTEMS

AUTHOR(s):
FURNAS, C. W.

AFFILIATION:
BELL LABORATORY

ABSTRACT:
THIS PAPER EXAMINES HOW IMPRECISION IN THE WAY HUMANS NAME
THINGS MIGHT LIMIT HOW WELL A COMPUTER CAN GUESS TO WHAT
THEY ARE REFERENCING. PEOPLE WERE ASKED TO NAME THINGS IN A
VARIETY OF DOMAINS : INSTRUCTIONS FOR TEXT EDITING
OPERATIONS, INDEX WORDS FOR COOKING RECIPES, CATEGORIES FOR
'WANT ADS' AND DESCRIPTIONS OF COMMON OBJECTS. IT WAS FOUND
THAT RANDOM PAIRS OF PEOPLE USED THE SAME WORD FOR AN OBJECT
ONLY 10 TO 20 PERCENT OF THE TIME. BUT IT WAS ALSO FOUND
THAT HIT RATES COULD BE INCREASED THREEFOLD BY USING NORMS
ON NAMING TO PICK OPTIMALS NAMES BY RECOGNIZING AS MANY OF
THE USERS' VARIOUS WORDS AS POSSIBLE AND BY ALLOWING THE
USER AND THE SYSTEM SEVERAL GUESSES IN TRYING TO HIT UPON
THE DESIRED TARGET.

REFERENCE CODE: 176

JOURNAL:
MEDICAL REFERENCE SERV. Q.
VOLUME: 2
ISSUE: 2
DATE: JUNE 1983
PAGES: 75 - 83

TITLE:
THE VETERAN MEDLINE SEARCHER'S ENCOUNTER WITH OTHER DATABASES

AUTHOR(s):
HEWISON N. S.

ABSTRACT:
MANY WHO ARE LONGTIME MEDLINE SEARCHES HAVE NOW BRANCHED OUT

INTO OTHER NON-NATIONAL LIBRARY OF MEDICINE (NLM) DATABASES. THEY ARE SEARCHING THE BUSINESS DATABASES FOR HOSPITAL ADMINISTRATORS, THE CHEMISTRY AND BIOLOGY FILES FOR BIOCHEMISTS, AND THE SOCIAL SCIENCE DATABASES FOR NURSES, STUDENTS, AND LIBRARY DIRECTORS. THE AUTHOR EXPLORES SOME OF THESE, UTILIZING COMPARISONS OF THE THESAURI OF THE MEDELINE, ERIC, AND PSY-INFO DATABASES.

REFERENCE CODE: 177

JOURNAL:
ONLINE
VOLUME: 7
ISSUE: 5
DATE: SEPTEMBER 1983
PAGES: 42 - 50

TITLE:
EXPERIENCES AT EXXON IN TRAINING END-USERS TO SEARCH
TECHNICAL DATABASES ONLINE

AUTHOR(s):
WALTON K. R., DEDERT, P. L.

AFFILIATION:
EXXON RES. & ENGINEERING CO.

ABSTRACT:
THIS ARTICLE DESCRIBES THE STRUCTURE AND FORMAT OF THE COURSES, THE BACKGROUND AND INTEREST OF THE PARTICIPANTS AND THE OVERALL COURSE GOALS. THE RELATIVE SUCCESS OF THE COURSES AS DETERMINED BY SEVERAL FACTORS (INCLUDING THE NUMBER OF END USERS WHO HAVE CONTINUED SEARCHING SINCE THE END OF THE TRAINING IS DISCUSSED WITHIN THE FRAMEWORK OF MAKING TRAINING COURSES MORE EFFECTIVE FOR END USERS. THE ARTICLE CONCLUDES WITH A GENERAL DISCUSSION OF END SEARCHING. THE DISCUSSION DEALS PARTICULARLY WITH THE PROBLEM OF THE END USER MAINTAINING COMPETENCE WHILE SEARCHING IN A CASUAL BASIS.

REFERENCE CODE: 178

JOURNAL:
AUTOMATIC & REMOTE CONTROL
VOLUME: 44
ISSUE: 1
DATE: JANUARY 1983
PAGES: 5 - 25

TITLE:
THEORETICAL ASPECTS OF RELATIONAL DATA BASE DESIGN

AUTHOR(s):
GORCHINSKAYA, O. YU.

ABSTRACT:
THE ARTICLE CONSIDERS THEORETICAL ASPECTS CONNECTED WITH THE RELATIONAL DATA BASE MODEL. SPECIAL EMPHASIS IS ON FORMALIZATION OF THE LOGICAL DESIGN OF RELATIONAL DATA BASE. CERTAIN KINDS OF INTEGRITY CONSTRAINTS ARE CONSIDERED AS WELL AS THE PROBLEM OF SCHEMA EQUIVALENCE, NORMAL FORMS OF RELATIONS, AND NORMALIZATION METHODS.

REFERENCE CODE: 179

JOURNAL:
INFOSYSTEMS
VOLUME: 30
ISSUE: 4
DATE: APRIL 1983
PAGES: 64 - 69

TITLE:
DBMS: LOGICAL MUST PRECEDE PHYSICAL DESIGN

AUTHOR(s):
ORR, K.

ABSTRACT:
PROBLEMS WITH DATA BASE MANAGEMENT SYSTEMS (DBMS) MAINLY LIE WITH THE PERSONNEL RATHER THAN THE SOFTWARE. GOOD DATA BASE DESIGNS CONSISTS, FIRST, OF UNDERSTANDING EXACTLY WHAT YOU WANT TO DO AND THEN DETERMINING THE BEST WAY TO GET THE DATA BASE SOFTWARE TO DO IT. LOGICAL DESIGN IS MOST IMPORTANT.

REFERENCE CODE: 180

JOURNAL:
PROCEEDINGS OF THE SIXTH ANNUAL INTERNATIONAL ACM SIGIR CONFERENCE ON RESEARCH AND DEVELOPMENT IN INFORMATION RETRIEVAL
DATE: JUNE 1983
PAGES: 162 - 176

TITLE:
END USER BEHAVIOR ON AN ONLINE INFORMATION RETRIEVAL SYSTEM:
A COMPUTER MONITORING STUDY

AUTHOR(s):
BORGMAN, C. L.

AFFILIATION:
OCLC ONLINE COMPUTER LIBRARY CENTER, DUBLIN, OH

ABSTRACT:
THE AUTHOR REPORTS ON A COMPUTER MONITORING STUDY OF USERS OF THE OHIO STATE LIBRARIES' ONLINE CATALOG, AND ESTABLISHED AND HEAVILY USED INFORMATION RETRIEVAL SYSTEM. THIS IS THE FIRST MONITORING STUDY OF AN ONLINE CATALOG PERFORMED WITHOUT SYSTEM-DEFINED USER SESSIONS. ONLINE CATALOGS REPRESENT A CLASS OF RETRIEVAL SYSTEMS WHICH RE DESIGNED FOR END USERS, REQUIRE LITTLE OR NO FORMAL TRAINING, AND REPLACE AN EXISTING FORMAL SYSTEM. THE STUDY CHARACTERIZES USERS BEHAVIOR IN TERMS OF TYPE OF SEARCHES DONE, PATTERNS OF USE, TYPE SPENT ON SEARCHING ERRORS, AND SYSTEM PROBLEMS. PRELIMINARY RESULTS SUGGESTS THAT USERS HAS MUCH SHORTER SESSIONS THAN IN OTHER TYPES OF RETRIEVAL SYSTEMS. PATTERNS OF USE VARY BETWEEN CAMPUS LIBRARIES, ACADEMIC QUARTERS, AND BETWEEN SHORT AND LONG SESSIONS. RESULTS OF THE STUDY WILL BE APPLIED TO IMPROVING THE USER INTERFACE AND OTHER SYSTEM FEATURES.

REFERENCE CODE: 181

JOURNAL:
PROCEEDINGS OF THE SIXTH ANNUAL INTERNATIONAL ACM SIGIR
CONFERENCE ON RESEARCH AND DEVELOPEMENT IN INFORMATION
RETRIEVAL
DATE: JUNE 1983
PAGES: 178 - 188

TITLE:
A NETWORK ORGANIZATION USED FOR DOCUMENT RETRIEVAL

AUTHOR(s):
CROFT, W.B., WOLF, R., THOMPSON R.

AFFILIATION:
AMHERTS UNIVERSITY

ABSTRACT:
A NETWORK ORGANIZATION FOR IMPLEMENTING A DOCUMENT RETRIEVAL SYSTEM IS PRO- POSED. THIS ORGANIZATION HAS SIGNIFICANT ADVANTAGES IN TERM OF THE RANGE OF SEARCHES THAT CAN BE USED WHEN COMPARED TO EITHER INVERTED OR CLUSTERED FILES ORGANIZATIONS. ALGORITHMS FOR GENERATING AND MAINTAINING THE NETWORK ARE DESCRIBED TOGETHER WITH EXPERIMENTS DESIGNED TO TEST THEIR EFFICIENCY AND EFFECTIVENESS.

REFERENCE CODE: 182

JOURNAL:

PROCEEDINGS OF THE SIXTH ANNUAL INTERNATIONAL ACM SIGIR
CONFERENCE ON RESEARCH AND DEVELOPMENT IN INFORMATION
RETRIEVAL

DATE: JUNE 1983

PAGES: 220 - 237

TITLE:

DERIVED SEARCH KEYS FOR BIBLIOGRAPHIC RETRIEVAL

AUTHOR(s):

YANNAKOUDAKIS, E. J.

AFFILIATION:

UNIVERSITY OF BRADFORD

ABSTRACT:

A PRINCIPLE OF INFORMATION SCIENCE STATES THAT THE ENTROPY
OF A SET OF SYMBOLS IS MAXIMIZED WHEN THE PROBABILITY OF
OCCURRENCE OF EACH BECOMES THE SAME. THIS PAPER PRESENTS THE
RESULTS OF A NUMBER OF EXPERIMENTS WHICH UTILIZE THIS
PRINCIPLE TO CONSTRUCT FIXED LENGTH KEYS FROM PERTINENT
FIELDS IN ORDER TO LOCATE AND RETRIEVE UNIQUE RECORDS AS
WELL AS CLUSTERS WITH LEXICALLY HOMOGENEOUS INFORMATION.
EACH KEY INCORPORATES CODES DERIVED BY VARIOUS POSITIONAL
SELECTION METHODS AND THEIR DISCRIMINATING STRENGTH PROVES
TO BE OVER 95%.

REFERENCE CODE: 183

JOURNAL:

PROCEEDINGS OF THE SIXTH ANNUAL INTERNATIONAL ACM SIGIR
CONFERENCE ON RESEARCH AND DEVELOPMENT IN INFORMATION
RETRIEVAL

DATE: JUNE 1983

PAGES: 115 - 121

TITLE:

A CLUSTERING SCHEME

AUTHOR(s):

CAN, F., OZKARAHAN E. A.

AFFILIATION:

ARIZONA STATE UNIVERSITY

ABSTRACT:

A CLUSTERING ALGORITHM IS DESCRIBED. THE ALGORITHM PROPOSED DETERMINES BOTH THE NUMBER OF CLUSTER IN A COLLECTION AND THE NUMBER OF ELEMENTS IN EACH CLUSTER BEFORE BEGINNING THE FINAL CLUSTERING PROCESS.

REFERENCE CODE: 184

JOURNAL:

PROCEEDINGS OF THE SIXTH ANNUAL INTERNATIONAL ACM SIGIR
CONFERENCE ON RESEARCH AND DEVELOPMENT IN INFORMATION
RETRIEVAL

DATE: JUNE 1983

PAGES: 122 - 128

TITLE:

THE NORMALIZED RECALL AND RELATED MEASURES

AUTHOR(s):

BOLLMANN, P.

AFFILIATION:

UNIVERSITY OF BERLIN

ABSTRACT:

THE NORMALIZED RECALL IS ONE OF THE MOST POPULAR EVALUATION MEASURES FOR INFORMATION RETRIEVAL SYSTEMS. AN OVERVIEW OF ITS DEVELOPMENT IS GIVEN. IT IS THEN SHOWN THAT THE NORMALIZED RECALL IS CLOSELY RELATED TO OTHER MEASURE SUCH AS THE CRE-MEASURE AND THE EXPECTED SEARCH LENGTH. SOME IMPLICATIONS ARE ANALYZED.

REFERENCE CODE: 185

JOURNAL:

JASIS

VOLUME: 34

ISSUE: 5

DATE: SEPTEMBER 1983

PAGES: 350 - 355

TITLE:

A CLUSTER ANALYSES OF RETRIEVAL PATTERNS AMONG BIBLIOGRAPHIC
DATABASES

AUTHOR(s):

YERKEY, A. N.

AFFILIATION:

STATE UNIVERSITY OF NEW YORK

ABSTRACT:

SEARCHES OF BIBLIOGRAPHICAL DATABASES ARE FACED WITH A MULTITUDE OF CHOICES, BUT VERY FEW CLUES, IN DEVELOPING PRECISE SEARCH STRATEGIES. THIS STUDY ATTEMPTS TO DISCOVER SUBJECT PATTERNS AND CLUSTERS AMONG DATABASES IN ORDER TO PROVIDE CLUES ABOUT DIFFERENCES AND SIMILARITIES AMONG THEM. DESCRIPTORS WERE TAKEN AT RANDOM FROM SEVEN SUBJECT CATEGORIES IN THE ERIC THESAURUS AND AND USED AS SEARCH TERMS ON BIBLIOGRAPHIC RETRIEVAL SERVICES' CROSS DATABASE. THE RESULTING 1830312 POSTING FROM 54 DATABASES WERE ANALYZED IN TWO WAYS: (1) AN EXPECTATION RATIO WAS COMPUTED WHICH ALLOWED RANKING DATABASES IN ORDER OF THEIR RELATIVE RESPONSES TO THE SUBJECT SEARCHES; (2) A CLUSTER ANALYSIS IS CONDUCTED TO DISCOVER POSSIBLE SUBJECT RELATIONSHIPS AMONG DATABASES. THE RESULT SHOW FIVE LARGE CLUSTERS : TECHNOLOGY, LIFE SCIENCES, BIBLIOGRAPHY, BUSINESS AND INDUSTRY, AND EDUCATION; AND 12 WELL DEFINED SUBCLUSTERS. IT ALSO SHOWS SEVERAL DIMENSION WITH CUT ACROSS CLUSTERS, SUCH AS RESEARCH AND SOCIAL AND ECONOMIC ENTERPRISE, AND INDICATES THAT THERE ARE NON-OBVIOUS SIMILARITIES AND DIFFERENCES AMONG DATABASES WHICH MAY PROVIDE

REFERENCE CODE: 186

JOURNAL:

THE 6TH ANNUAL INTERNATIONAL ACM SIGIR CONFERENCE ON RESEARCH AND DEVELOPMENT IN INFORMATION RETRIEVAL

DATE: JUNE 1983

PAGES: 25 - 30

TITLE:

INTELLIGENT INFORMATION SYSTEMS

AUTHOR(s):

LEBOWITZ

AFFILIATION:

COLUMBIA UNIVERSITY

ABSTRACT:

NATURAL LANGUAGE PROCESSING TECHNIQUES DEVELOPED FOR ARTIFICIAL INTELLIGENCE PROGRAMS CAN AID IN CONSTRUCTING POWERFUL INFORMATION RETRIEVAL SYSTEMS IN AT LEAST TWO AREAS. AUTOMATIC CONSTRUCTION OF NEW CONCEPTS ALLOWS A LARGE BODY OF INFORMATION TO BE ORGANIZED COMPACTLY IN A MANNER THAT ALLOWS A WIDE RANGE OF QUERIES TO BE ANSWERED. ALSO, USING NATURAL LANGUAGE PROCESSING TECHNIQUES TO CONCEPTUALLY ANALYZE THE DOCUMENTS BEING STORED IN A SYSTEM GREATLY EXPANDS THE EFFECTIVENESS OF QUERIES ABOUT GIVEN PIECES OF TEXT. HOWEVER, ONLY ROBUST CONCEPTUAL ANALYSIS METHODS ARE

ADEQUATE FOR SUCH SYSTEMS. THIS PAPER DISCUSSES APPROACHES TO BOTH CONCEPT LEARNING, IN THE FORM OF GENERALIZED-BASED MEMORY AND, POWERFUL, ROBUST TEXT PROCESSING ACHIEVED BY MEMORY-BASED UNDERSTANDING. THESE TECHNIQUES HAVE BEEN IMPLEMENTED IN THE COMPUTER SYSTEM IPP, A PROGRAM THAT READS, REMEMBERS AND GENERALIZES FROM NEW STORIES ABOUT TERRORISM, AND RESEARCHER, CURRENTLY IN THE PROTOTYPE STAGE, THAT OPERATES IN A VERY DIFFERENT DOMAIN (TECHNICAL TEXTS, PATENT ABSTRACTS IN PARTICULAR).

REFERENCE CODE: 187

JOURNAL:

THE SIXTH ANNUAL INTERNATIONAL ACM SIGIR CONFERENCE ON RESEARCH AND DEVELOPMENT IN INFORMATION RETRIEVAL

DATE: JUNE 1983

PAGES: 31 - 47

TITLE:

USING DISCOURSE ANALYSIS FOR THE DESIGN OF INFORMATION RETRIEVAL INTERACTION MECHANISMS

AUTHOR(s):

BROOKS, H. M.

AFFILIATION:

UNIVERSITY OF LONDON

ABSTRACT:

INFORMATION RETRIEVAL (IR) SYSTEMS MAY, IN GENERAL, BE CONSIDERED AS CONSIST- ING OF A USER, AN INTERACTIVE MECHANISM, AND A KNOWLEDGE RESOURCE INTEGRATED ABOUT THE COMMON GOAL OF HELPING THE USER SUCCESSFULLY TO MANAGE THE PRO- BLEM THAT HAS INDUCED HIM/HER TO INITIATE THE SYSTEM. IN THESE TERMS, WHAT ARE CALLED 'ON-LINE IR SYSTEMS' CAN BE SEEM AS AN INFORMATION INTERACTION MECHAN- ISM (CONSISTING USUALLY OF A HUMAN INTERMEDIARY, SOME INTERACTION CAPABILITIES BETWEEN INTERMEDIARY AND DATA BASE, A RETRIEVAL LANGUAGE AND A RETRIEVAL STRATEGY) AND A KNOWLEDGE RESOURCE (MEANING THE DATA BASE ITSELF). A MAJOR GOAL OF IR RESEARCH AT THE MOMENT IS TO ALLOW THE USER DIRECT ACCESS TO THE DATA BASE WITHOUT RECOURSE TO THE HUMAN INTERMEDIARY. THE AUTHOR ANALYZE A NUMBER OF DIALOGUES. THEY DISCUSS THE DESIGN OF AN IRS, IS ONE.

REFERENCE CODE: 188

JOURNAL:

THE SIXTH ANNUAL INTERNATIONAL ACM SIGIR CONFERENCE ON

RESEARCH AND DEVELOPMENT IN INFORMATION RETRIEVAL
DATE: JUNE 1983
PAGES: 75 - 80

TITLE:
NATURAL LANGUAGE GRAMMARS FOR INFORMATION SYSTEM

AUTHOR(s):
DE SOPENA, L.

AFFILIATION:
UNIVERSITY DEL PAIS VASCO, SPAIN

ABSTRACT:
THE USER SPECIALITY LANGUAGES (USL) SYSTEM IS AN APPLICATION INDEPENDENT NATURAL LANGUAGE INTERFACE TO A RELATIONAL DATABASE SYSTEM. IT PROVIDES NONDP-TRAINED PEOPLE WITH A TOOL TO INTRODUCE, QUERY, MANIPULATE, AND ANALYZE THE DATA STORED IN A RELATIONAL DATABASE VIA NATURAL LANGUAGE. USL INTERFACES WITH DIFFERENT LANGUAGES; IN THE PRESENT PAPER THE GRAMMAR DEVELOPED FOR SPANISH IS PRESENTED, AND COMPARED WITH THE GERMAN GRAMMAR WHICH WAS PREVIOUSLY IMPLEMENTED AND UPON WHICH IT IS BASED. THEIR MAIN DIFFERENCES ARE POINT OUT, AND THE GENERALITY OF THE SYSTEM TO DEAL WITH OTHER NATURAL LANGUAGES IS SHOWN.

REFERENCE CODE: 189

JOURNAL:
PROCEEDINGS OF THE SIXTH ANNUAL INTERNATIONAL ACM SIGIR
CONFERENCE ON RESEARCH AND DEVELOPMENT IN INFORMATION
RETRIEVAL
DATE: JUNE 1983
PAGES: 252 - 263

TITLE:
SOME RESEARCH PROBLEMS IN AUTOMATIC INFORMATION RETRIEVAL

AUTHOR(s):
SALTON, G.

AFFILIATION:
CORNELL UNIVERSITY

ABSTRACT:
INFORMATION RETRIEVAL COMPONENTS ARE CURRENTLY INCORPORATED IN SEVERAL TYPES OF INFORMATION SYSTEMS, INCLUDING BIBLIOGRAPHIC RETRIEVAL SYSTEMS, DATA BASE MANAGEMENT SYSTEMS AND QUESTION-ANSWERING SYSTEMS. SOME OF THE PROBLEMS ARISING IN THE REAL TIME ENVIRONMENT IN WHICH THESE SYSTEMS OPERATE ARE BRIEFLY DISCUSSED. CERTAIN RECENT ADVANCES IN

INFORMATION RETRIEVAL RESEARCH ARE THEN MENTIONED, INCLUDING THE FORMULATION OF NEW PROBABILISTIC RETRIEVAL MODELS, AND THE DEVELOPMENT OF AUTOMATIC DOCUMENT ANALYSIS AND BOOLEAN QUERY PROCESSING TECHNIQUES.

REFERENCE CODE: 190

JOURNAL:

THE ANNUAL INTERNATIONAL ACM SIGIR CONFERENCE ON RESEARCH AND DEVELOPMENT IN INFORMATION RETRIEVAL

DATE: JUNE 1983

PAGES: 264 - 265

TITLE:

INFORMATION RETRIEVAL: NEW DIRECTIONS: OLD SOLUTIONS

AUTHOR(s):

RISJSBERGEN, C. J.

ABSTRACT:

THE AUTHOR EXAMINES THE QUESTION OF RELEVANCE OF RETRIEVAL DOCUMENTS. HE LOOKS AT THREE TYPES OF QUERIES AND HOW THESE AFFECTS IRS DESIGN. HE FORSEES AN INTEGRATION BETWEEN DBMS, IR AND EXPERT SYSTEMS.

REFERENCE CODE: 191

JOURNAL:

ASLIB PROCEEDINGS

VOLUME: 35

ISSUE: 9

DATE: SEPTEMBER 1983

PAGES: 346 - 353

TITLE:

EXTERNAL DATABASES: AN OVERVIEW

AUTHOR(s):

FOSTER, A.

ABSTRACT:

A TOPOLOGY FOR EXTERNAL ONLINE DATABASES IS PRESENTED AND THE CURRENT NUMBER OF BIBLIOGRAPHIC AND SOURCE DATABASES IS ACCESSED. THE NATURE AND IMPORTANCE OF SOURCE DATABASES, PARTICULARLY FULL TEXT AND NUMERIC SERVICES, IS DISCUSSED. INFORMATION PROFESSIONALS MUST EMBRACE THESE NEW PRODUCTS IF THEY ARE TO MAINTAIN AND EXTEND THEIR ROLE IN INFORMATION TRANSFER.

REFERENCE CODE: 192

JOURNAL:
1983 NATIONAL COMPUTER CONFERENCE
DATE: MAY 1983
PAGES: 241 - 245

TITLE:
PROGRESS TOWARD DATABASE MANAGEMENT STANDARDS

AUTHOR(s):
DEUTSCH, D. R.

AFFILIATION:
GENERAL ELECTRIC INFORMATION SERVICES

ABSTRACT:
THE FIRST PROPOSAL FOR DATABASE MANAGEMENT STANDARDS
APPEARED IN THE LATE 1960S. WORK BEGAN ON A US NATIONAL
STANDARD IN 1978. TODAY THERE ARE NO DOMESTIC OR
INTERNATIONAL DATABASE MANAGEMENT STANDARDS ALTHOUGH
ORGANIZA- TIONS THROUGHOUT THE WORD ARE WORKING TOWARD THIS
GOAL. THIS PAPER DESCRIBES THESE VARIOUS ORGANIZATIONS AND
THE STATUS OF THEIR WORK. IT OUTLINES RECENT CHANGES IN THE
STRUCTURE AND SCOPE OF THE AMERICAN DATABASE MANAGEMENT
STANDARDIZATION ACTIVITIES THAT HAVE SUBSTANTIALLY IMPROVED
THE OUTLOOKS FOR TIMELY RESULTS.

REFERENCE CODE: 193

JOURNAL:
1983 NATIONAL COMPUTER CONFERENCE
DATE: MAY 1983
PAGES: 293 - 298

TITLE:
COST-EFFECTIVE WAYS OF IMPROVING DATABASE COMPUTER
PERFORMANCE

AUTHOR(s):
HSIAO, D. K.

AFFILIATION:
NAVAL POSTGRADUATE SCHOOL

ABSTRACT:
IN THIS PAPER THE HARDWARE FEATURES THAT CHARACTERIZE THE
PERFORMANCE BOT- TLENECK OF CONVENTIONAL DATABASE COMPUTERS
ARE IDENTIFIED. MOTIVATIONS FOR AND PROPOSAL OF NEW

ARCHITECTURES FOR OVERCOMING THE BOTTLENECKS FOR FUTURE
DATABASE COMPUTERS ARE GIVEN.

REFERENCE CODE: 194

JOURNAL:
20TH ANNUAL MEETING OF THE ASSOCIATION FOR COMPUTATIONAL
LINGUISTICS
DATE: JUNE 1982
PAGES: 44 - 45

TITLE:
NATURAL LANGUAGE ACCESS TO DATABASES - THEORETICAL/TECHNICAL
ISSUES

AUTHOR(s):
MOORE, R. C.

AFFILIATION:
ARTIFICIAL INTELLIGENCE CENTER, SRI INTERNAT

ABSTRACT:
ALTHOUGH THERE HAVE BEEN MANY EXPERIMENTAL SYSTEMS FOR
NATURAL-LANGUAGE ACCESS TO DATABASES WITH SOME NOW GOING
INTO ACTUAL USE, MANY PROBLEMS IN THE AREA REMAIN TO BE
SOLVED. THE AUTHOR PRESENTS DESCRIPTIONS OF FIVE PROB- LEM
AREAS THAT SEEM TO ME NOT TO BE ADEQUATELY HANDLED BY ANY
EXISTING SYSTEM.

REFERENCE CODE: 195

JOURNAL:
IEEE TRANSACTION SOFTWARE ENGINEERING
VOLUME: 8
ISSUE: 6
DATE: NOVEMBER 1982
PAGES: 563 - 573

TITLE:
THE LOGICAL ACCESS PATH SCHEMA OF A DATABASE

AUTHOR(s):
ROUSSOPOULOS, N.

AFFILIATION:
UNIVERSITY OF MARYLAND

ABSTRACT:
A SCHEMA WHICH MODELS THE USAGE OF THE LOGICAL ACCESS PATHS

OF THE DATABASE IS PROPOSED. THE SCHEMA MODELS OF DATABASE ACTIVITIES (I.E. RETRIEVALS, AND UPDATES), AND INTEGRATES THEIR LOGICAL ACCESS PATHS BY RECOGNIZING COMMON SUBPATHS AND INCREASING THE 'WEIGHT' OF THE SHARED SUBPATHS. THE LOGICAL ACCESS PATH SCHEMA PROVIDES A COMPREHENSIVE PICTURE OF THE LOGICAL ACCESS PATHS, AND THE CUMULATIVE USAGE OF THE SHARED SUBPATHS AND/OR INTERMEDIATE RESULTS. THE SCHEMA SERVES A DUAL PURPOSE. FIRSTLY, IT IS USED AS A MODEL OF THE ACCESS REQUIREMENTS DURING THE DATABASE DESIGN, AND SECONDLY, AS THE BASIS FOR OPTIMIZATION DURING THE OPERATION OF THE DATABASE.

REFERENCE CODE: 196

JOURNAL:
IEEE TRANSACTION SOFTWARE ENGINEERING
VOLUME: 8
ISSUE: 6
DATE: NOVEMBER 1982
PAGES: 611 - 619

TITLE:
ANALYSIS OF EXTENDIBLE HASHING

AUTHOR(s):
MENDELSON, H.

AFFILIATION:
UNIVERSITY OF ROCHESTER

ABSTRACT:
EXTENDIBLE HASHING IS AN ATTRACTIVE DIRECT-ACCESS TECHNIQUE WHICH HAS BEEN INTRODUCED RECENTLY. IT IS CHARACTERIZED BY A COMBINATION OF DATABASE-SIZE FLEXIBILITY AND FAST DIRECT ACCESS. THIS PAPER DERIVES PERFORMANCE MEASURES FOR EXTENDIBLE HASHING, AND CONSIDERS THEIR IMPLICATIONS ON THE PHYSICAL DATABASE DESIGN. A COMPLETE CHARACTERIZATION OF THE PROBABILITY DISTRIBUTION OF THE DIRECTORY SIZE AND DEPTH IS DERIVED, AND ITS IMPLICATIONS ON THE DESIGN OF THE DIRECTORY ARE STUDIED. THE EXPECTED INPUT/OUTPUT COSTS OF VARIOUS OPERATIONS ARE DERIVED, AND THE EFFECTS OF VARYING PHYSICAL DESIGN PARAMETERS ON THE EXPECTED AVERAGE OPERATING COST AND ON THE EXPECTED VOLUME ARE STUDIED.

ATTACHMENT 6.9

**USL DBMS PME BIBLIOGRAPHIC
SUPPORT DATA BASE STATUS**

USL NASA.PME MADAM DATA BASE STATUS

Logical data base name	: NASA.PME
Physical data base path name	: >udd>DEMS>NASA/R&D
Date Inversion	: yes
Text Inversion	: yes
Standard Stopword List	: yes
User Stopword List	: no
User Keyword List	: no
Comments File	: no
Bulletin File	: no
Thesaurus File	: no
Macro File	: no
Textual Description	: no
Public/Private File	: public
Data Base Administrator	: TangKS.DEMS
Number of Records	: 53
Creation Date	: 08/01/84
Latest Update	: 08/01/84

REFERENCE CODE: 1

JOURNAL:
ACM COMPUTING SURVEYS
VOLUME: 7
ISSUE: 2
DATE: JUNE 1975
PAGES: 73 - 93

TITLE:
A STRAIGHTFORWARD MODEL FOR COMPUTER PERFORMANCE PREDICTION

AUTHOR(s):
BOYSE, JOHN W. * WARN, DAVID R.

AFFILIATION:
RESEARCH LABORATORIES, GENERAL MOTORS CORPORATION, WARREN

ABSTRACT:
BOTH SIMULATION AND ANALYTIC MODELS OF COMPUTER SYSTEMS CAN BE VERY USEFUL FOR PREDICTING THE PERFORMANCE OF PROPOSED NEW SYSTEMS OR PROPOSED CHANGES TO EXISTING SYSTEMS. UNFORTUNATELY, MANY POTENTIAL USERS OF MODELS ARE RELUCTANT TO USE THEM BECAUSE OF THE COMPLEXITY OF MANY SUCH MODELS AND THE DIFFICULTY OF RELATING THE MODEL TO THE REAL SYSTEM. THIS TUTORIAL PAPER LEADS THE READER THROUGH THE DEVELOPMENT AND USE OF AN EASILY UNDERSTOOD ANALYTIC MODEL. THIS IS THEN PLACED IN CONTEXT WITH A CLASS OF SIMILAR ANALYTIC MODELS. IN SPITE OF THE SIMPLICITY (UTILIZATION, THROUGHPUT, AND RESPONSE) USING ONLY THE MOST BASIC SYSTEM DATA AS INPUT. THESE PARAMETERS CAN EITHER BE ESTIMATES OR MEASUREMENTS FROM A RUNNING SYSTEM. THE MODEL EQUATIONS AND ASSUMPTIONS ARE DEFINED, AND A DETAILED CASE STUDY IS PRESENTED AS AN EXAMPLE OF THEIR USE.

KEYWORDS:
COMPUTER PERFORMANCE PREDICTION * ANALYTIC MODELS * QUEUEING
* SIMULATION.

CATEGORIES:
4.32 * 4.6 * 6.20 * 8.1

REFERENCE CODE: 2

JOURNAL:
ACM COMPUTING SURVEYS
VOLUME: 10
ISSUE: 1
DATE: MARCH 1978
PAGES: 3 - 18

TITLE:
A REVIEW AND EVALUATION OF SOFTWARE SCIENCE

AUTHOR(s):
FITZSIMMONS, ANN * LOVE, TOM

AFFILIATION:
GENERAL ELECTRIC COMPANY

ABSTRACT:
DURING RECENT YEARS, THERE HAVE BEEN MANY ATTEMPTS TO DEFINE AND MEASURE THE "COMPLEXITY" OF A COMPUTER PROGRAM. MAURICE HALSTEAD HAS DEVELOPED A THEORY THAT GIVES OBJECTIVE MEASUREMENTS OF SOFTWARE COMPLEXITY. VARIOUS STUDIES AND EXPERIMENTS HAVE SHOWN THAT THE THEORY'S PREDICTIONS OF THE NUMBER OF BUGS IN PROGRAMS AND OF THE TIME REQUIRED TO IMPLEMENT A PROGRAM ARE AMAZINGLY ACCURATE. IT IS A PROMISING THEORY WORTHY OF MUCH MORE PROBING SCIENTIFIC INVESTIGATION. THIS PAPER REVIEWS THE THEORY, CALLED "SOFTWARE SCIENCE", AND THE EVIDENCE SUPPORTING IT. A BRIEF DESCRIPTION OF A RELATED THEORY, CALLED "SOFTWARE PHYSICS", IS INCLUDED.

KEYWORDS:
SOFTWARE RELIABILITY * SOFTWARE ENGINEERING * SOFTWARE MANAGEMENT * COGNITIVE PSYCHOLOGY * SOFTWARE MEASUREMENT * SOFTWARE COMPLEXITY

CATEGORIES:
4.0 * 4.6

REFERENCE CODE: 3

JOURNAL:
ACM COMPUTING SURVEYS
VOLUME: 10
ISSUE: 1
DATE: MARCH 1978
PAGES: 19 - 34

TITLE:

COST-BENEFIT ANALYSIS IN INFORMATION SYSTEMS DEVELOPMENT AND OPERATION

AUTHOR(s):

KING, JOHN LESLIE * SCHREMS, EDWARD L.

AFFILIATION:

THE URBIS GROUP, PUBLIC RESEARCH ORGANIZATION, UNIVERSITY OF CALIFORNIA, IRVINE, CALIFORNIA

ABSTRACT:

COST-BENEFIT ANALYSIS OF COMPUTER-BASED INFORMATION SYSTEMS IS A MAJOR CONCERN OF MANAGERS IN PUBLIC AND PRIVATE ORGANIZATIONS USING COMPUTERS. THIS PAPER INTRODUCES AND REVIEWS BASIC ELEMENTS OF COST-BENEFIT ANALYSIS AS APPLIED TO COMPUTERIZED INFORMATION SYSTEMS, AND PROVIDES DISCUSSION OF THE MAJOR PROBLEMS TO BE AVOIDED.

KEYWORDS:

COST-BENEFIT ANALYSIS * MANAGEMENT OF COMPUTING * EVALUATING

CATEGORIES:

1.3 * 2.40 * 2.41 * 2.49 * 3.52 * 3.53

REFERENCE CODE:

4

JOURNAL:

ACM COMPUTING SURVEYS

VOLUME: 10

ISSUE: 3

DATE: SEPTEMBER 1978

PAGES: 263 - 280

TITLE:

A MEASUREMENT PROCEDURE FOR QUEUEING NETWORK MODELS OF COMPUTER SYSTEMS

AUTHOR(s):

ROSE, CLIFFORD A.

AFFILIATION:

NAVAL ELECTRONIC SYSTEMS COMMAND, WASHINGTON, D.C. 20360

ABSTRACT:

THIS TUTORIAL PAPER DESCRIBES A PROCEDURE FOR OBTAINING INPUT PARAMETER VALUES AND OUTPUT PERFORMANCE MEASURES FOR A POPULAR CLASS OF QUEUEING NETWORK MODELS. THE PROCEDURE MAKES USE OF CURRENT MEASUREMENT MONITORS AS MUCH AS POSSIBLE. WE SURVEY THE TWO BASIC APPROACHES TO MONITORING (HARDWARE, SOFTWARE, AND HYBRID). ALSO SURVEYED ARE MEASUREMENT TOOLS FOR THE ANALYTICAL MODELING OF SEVERAL

CURRENT FAMILIES OF COMPUTER SYSTEMS. WE DISCUSS IN DETAIL
EXAMPLES OF MODEL VALIDATION AND PERFORMANCE PREDICTIONS TO
ILLUSTRATE THE MEASUREMENT PROCEDURES AND THE CLASS OF
MODELS.

KEYWORDS:

QUEUEING NETWORK MODELS * ANALYTICAL MODELS * MODEL
VALIDATIONS * PERFORMANCE EVALUATION * MEASUREMENTS *
MONITORS

CATEGORIES:

8.1 * 4.3

REFERENCE CODE: 5

JOURNAL:

ACM COMPUTING SURVEYS

VOLUME: 11

ISSUE: 4

DATE: DECEMBER 1979

PAGES: 371 - 395

TITLE:

DATABASE REORGANIZATION — PRINCIPLES AND PRACTICE

AUTHOR(s):

SOCKUT, GRAY H. * GOLDBERG, ROBERT P.

AFFILIATION:

INSTITUTE FOR COMPUTER SCIENCES AND TECHNOLOGY, NATIONAL
BUREAU OF STANDARDS * BGS SYSTEMS, INC.

ABSTRACT:

DATABASE REORGANIZATION CAN BE DEFINED AS CHANGING SOME
ASPECT OF THE WAY IN WHICH A DATABASE IS ARRANGED LOGICALLY
AND/OR PHYSICALLY. AN EXAMPLE IS CHANGING FROM A ONE-TO-ONE
TO A ONE-TO-MANY RELATIONSHIP. REORGANIZATION IS A NECESSARY
FUNCTION IN A DATABASE SYSTEM. THIS PAPER INTRODUCES THE
BASIC CONCEPTS OF REORGANIZATION, INCLUDING WHY IT IS
PERFORMED. MANY TYPES OF REORGANIZATION ARE DESCRIBED AND
CLASSIFIED INTO LOGICAL/PHYSICAL LEVELS. THEN PRAGMATIC
ISSUES SUCH AS REORGANIZATION STRATEGIES, A SURVEY OF
SEVERAL COMMERCIAL REORGANIZATION FACILITIES, CASE STUDIES,
AND DATABASE ADMINISTRATION CONSIDERATIONS ARE COVERED.
FINALLY, SEVERAL RESEARCH EFFORTS ARE SURVEYED.

KEYWORDS:

DATABASE * DATABASE MANAGEMENT * REORGANIZATION *
RESTRUCTURING * FILE MAINTENANCE

CATEGORIES:

2.43 * 3.51 * 3.73 * 4.33 * 4.34

REFERENCE CODE: 6

JOURNAL:
ACM COMPUTING SURVEYS
VOLUME: 14
ISSUE: 2
DATE: JUNE 1982
PAGES: 245 - 286

TITLE:
THE INTEGRATED DICTIONARY/DIRECTORY SYSTEM

AUTHOR(s):
ALLEN, FRANK W. * LOOMIS, MARY E. S. * MANNINO, MICHAEL V.

AFFILIATION:
DEPARTMENT OF MANAGEMENT INFORMATION SYSTEMS, UNIVERSITY OF
ARIZONA,

ABSTRACT:
THE CONCEPT OF AN INTEGRATED DICTIONARY/DIRECTORY (D/D)
SYSTEM IS DISCUSSED IN DETAIL, AND THE STATE OF CURRENT
SYSTEMS IN BOTH THE CENTRALIZED AND DISTRIBUTED DATABASE
ENVIRONMENTS IS SURVEYED. FOR THE CENTRALIZED DATABASE
ENVIRONMENT, THREE ASPECTS ARE EMPHASIZED: (1) THE SOFTWARE
INTERFACES BETWEEN THE D/D SYSTEM AND OTHER SOFTWARE
PACKAGES, (2) THE CONVERT FUNCTION OF THE D/D SYSTEM, AND
(3) THE ENVIRONMENTAL DEPENDENCY BETWEEN THE D/D SYSTEM AND
A DATABASE MANAGEMENT SYSTEM (DBMS). FOR THE DISTRIBUTED
DATABASE ENVIRONMENT, THE ARTICLE ELUCIDATES THE NECESSARY
EXTENSIONS TO THE CENTRALIZED D/D, THE ADDITIONAL SOFTWARE
INTERFACES REQUIRED, AND THE USE OF THE D/D AS A DISTRIBUTED
DATABASE. AN EXAMPLE OF A COMMERCIAL D/D SYSTEM THAT IS
INTEGRATED WITH A DISTRIBUTED DBMS IS PRESENTED.

KEYWORDS:
DOCUMENTATION * LANGUAGES * MANAGEMENT

CATEGORIES:
3.72 * 4.33

REFERENCE CODE: 7

JOURNAL:
ACM COMPUTING SURVEYS
VOLUME: 14
ISSUE: 2

DATE: JUNE 1982
PAGES: 287 - 313

TITLE:
COMPARATIVE MODELS OF THE FILE ASSIGNMENT PROBLEM

AUTHOR(s):
DOWDY, LAWRENCE W. * FOSTER, DERRELL V.

AFFILIATION:
VANDERBILT UNIVERSITY, NASHVILLE, TENNESSEE

ABSTRACT:
THE OPTIMAL DISTRIBUTION OF FILES AMONG STORAGE NODES IS A MAJOR PROBLEM IN COMPUTER SYSTEM OPTIMIZATION. DIFFERING DESIGN GOALS, VARYING SYSTEM ASSUMPTIONS, AND CONTRASTING SOLUTION TECHNIQUES YIELD A DISPARITY OF OPTIMAL FILE ASSIGNMENTS. THIS PAPER VIEWS THE DIFFERING FILE ASSIGNMENT MODELS IN A UNIFORM MANNER. RELATIVE ADVANTAGES AND WEAKNESSES OF THE VARIOUS MODELS BECOME IMMEDIATELY APPARENT. THIS PERSPECTIVE EXPOSES THE FURTHER RESEARCH WHICH IS NECESSARY IN ORDER TO PROVIDE A TRULY SATISFACTORY SOLUTION TO THE FILE ASSIGNMENT PROBLEM.

KEYWORDS:
ALGORITHMS * DESIGN * PERFORMANCE * FILE ASSIGNMENT *
COMPUTER NETWORKS * QUEUEING NETWORK MODELS

CATEGORIES:
3.72 * 6.34

REFERENCE CODE: 8

JOURNAL:
ACM COMPUTING SURVEYS
VOLUME: 15
ISSUE: 1
DATE: MARCH 1983
PAGES: 45 - 79

TITLE:
TECHNIQUES FOR STRUCTURING DATABASE RECORDS

AUTHOR(s):
MARCH, SALVATORE T.

AFFILIATION:
UNIVERSITY OF MINNESOTA

ABSTRACT:
STRUCTURING DATABASE RECORDS BY CONSIDERING DATA ITEM USAGE

CAN YIELD SUBSTANTIAL EFFICIENCIES IN THE OPERATING COST OF DATABASE SYSTEMS. HOWEVER, SINCE THE NUMBER OF POSSIBLE PHYSICAL RECORD STRUCTURES FOR DATABASE OF PRACTICAL SIGNIFICANCE IS ENORMOUS, AND THEIR EVALUATION IS EXTREMELY COMPLEX DETERMINING EFFICIENT RECORD STRUCTURES BY FULL ENUMERATION IS GENERALLY INFEASIBLE. THIS PAPER DISCUSSES THE TECHNIQUES OF MATHEMATICAL CLUSTERING, ITERATIVE GROUPING REFINEMENT, MATHEMATICAL PROGRAMMING, AND, HIERARCHIC AGGREGATION, WHICH CAN BE USED TO QUICKLY DETERMINE EFFICIENT RECORD STRUCTURES FOR LARGE, SHARED DATABASES.

KEYWORDS:

ECONOMICS * PERFORMANCE * AGGREGATION * RECORD SEGMENTATION
* RECORD STRUCTURES

CATEGORIES:

3.73 * 4.33 * 4.34 * 4.6

REFERENCE CODE: 9

JOURNAL:

TODS

VOLUME: 1

ISSUE: 1

DATE: MARCH 1976

PAGES: 66-94

TITLE:

OPTIMAL ALLOCATION OF RESOURCES IN DISTRIBUTED INFORMATION NETWORKS

AUTHOR(s):

MAHMOUD, SAMY * RIORDON, J. S.

AFFILIATION:

CARLETON UNIVERSITY, CANADA

ABSTRACT:

THE PROBLEMS OF FILE ALLOCATION AND CAPACITY ASSIGNMENT IN A FIXED TOPOLOGY DISTRIBUTED COMPUTER NETWORK ARE EXAMINED. THESE TWO ASPECTS OF THE DESIGN ARE TIGHTLY COUPLED BY MEANS OF AN AVERAGE MESSAGE DELAY CONSTRAINT. THE OBJECTIVE IS TO ALLOCATE COPIES OF INFORMATION FILES TO NETWORK NODES AND CAPACITIES TO NETWORK LINKS SO THAT A MINIMUM COST IS ACHIEVED SUBJECT TO NETWORK DELAY AND FILE AVAILABILITY CONSTRAINTS. A MODEL FOR SOLVING THE PROBLEM IS FORMULATED AND THE RESULTING OPTIMIZATION PROBLEM IS SHOWN TO FALL INTO A CLASS OF NONLINEAR INTEGER PROGRAMMING PROBLEMS. DETERMINISTIC TECHNIQUES FOR SOLVING THIS CLASS OF PROBLEMS ARE COMPUTATIONALLY CUMBERSOME, EVEN FOR SMALL SIZE

PROBLEMS. A NEW HEURISTIC ALGORITHM IS DEVELOPED, WHICH IS BASED ON A DECOMPOSITION TECHNIQUE THAT GREATLY REDUCES THE COMPUTATIONAL COMPLEXITY OF THE PROBLEM. NUMERICAL RESULTS FOR A VARIETY OF NETWORK CONFIGURATIONS INDICATE THAT THE HEURISTIC ALGORITHM, WHILE NOT THEORETICALLY CONVERGENT, YIELDS PRACTICABLE LOW COST SOLUTIONS WITH SUBSTANTIAL SAVINGS IN COMPUTER PROCESSING TIME AND STORAGE REQUIREMENTS. MOREOVER, IT IS SHOWN THAT THIS ALGORITHM IS CAPABLE OF SOLVING REALISTIC NETWORK PROBLEMS WHOSE SOLUTIONS USING DETERMINISTIC TECHNIQUES ARE COMPUTATIONALLY INTRACTABLE.

KEYWORDS:

INFORMATION NETWORKS * DATA FILES * LINK CAPACITIES *
RESOURCE SHARING * DISTRIBUTED COMPUTING

CATEGORIES:

3.81 * 4.9 * 7.4

REFERENCE CODE: 10

JOURNAL:

TODS

VOLUME: 1

ISSUE: 4

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PAGES: 317 - 343

TITLE:

PERFORMANCE OF A DATABASE MANAGER IN A VIRTUAL MEMORY SYSTEM

AUTHOR(s):

SHERMAN, STEPHEN W. * BRICE, RICHARD S.

AFFILIATION:

NASA LANGLEY RESEARCH CENTER * GEORGE WASHINGTON UNIVERSITY

ABSTRACT:

BUFFER SPACE IS CREATED AND MANAGED IN DATABASE SYSTEMS IN ORDER TO REDUCE ACCESSES TO THE I/O DEVICES FOR DATABASE INFORMATION. IN SYSTEMS USING VIRTUAL MEMORY ANY INCREASE IN THE BUFFER SPACE MAY BE ACCOMPANIED BY AN INCREASE IN PAGING. THE EFFECTS OF THESE FACTORS ON SYSTEM PERFORMANCE ARE QUANTIFIED WHERE SYSTEM PERFORMANCE IS A FUNCTION OF PAGE FAULTS AND DATABASE ACCESSES TO I/O DEVICES. THIS PHENOMENON IS EXAMINED THROUGH THE ANALYSIS OF EMPIRICAL DATA GATHERED IN A MULTIFACTOR EXPERIMENT. THE FACTORS CONSIDERED ARE MEMORY SIZE, SIZE OF BUFFER SPACE, MEMORY REPLACEMENT ALGORITHM. THE IMPROVEMENT OF SYSTEM PERFORMANCE THROUGH AN INCREASE IN THE SIZE OF THE BUFFER SPACE IS DEMONSTRATED. IT IS ALSO SHOWN THAT FOR CERTAIN VALUES OF

THE OTHER FACTORS AN INCREASE IN THE SIZE OF THE BUFFER SPACE CAN CAUSE PERFORMANCE TO DETERIORATE.

KEYWORDS:

PERFORMANCE * DATABASE MANAGEMENT * VIRTUAL MEMORY * DOUBLE
PAGING * VIRTUAL BUFFER * PAGE FAULTS * PAGE REPLACEMENT
ALGORITHM * BUFFER MANAGER

CATEGORIES:

3.72 * 4.3 * 4.33 * 4.35 * 4.6

REFERENCE CODE: 11

JOURNAL:

TODS

VOLUME: 1

ISSUE: 4

DATE: DECEMBER 1976

PAGES: 370 - 387

TITLE:

ON USER CRITERIA FOR DATA MODEL EVALUATION

AUTHOR(s):

McGEE, WILLIAM C.

AFFILIATION:

IBM CORPORATION

ABSTRACT:

THE EMERGENCE OF A DATABASE TECHNOLOGY IN RECENT YEARS HAS FOCUSED INTEREST ON THE SUBJECT OF DATA MODELS. A DATA MODEL IS THE CLASS OF LOGICAL DATA STRUCTURES WHICH A COMPUTER SYSTEM OR LANGUAGE MAKES AVAILABLE TO THE USER FOR THE PURPOSE OF FORMULATING DATA PROCESSING APPLICATIONS. THE DIVERSITY OF COMPUTER SYSTEMS AND LANGUAGES HAS RESULTED IN A CORRESPONDING DIVERSITY OF DATA MODELS, AND HAS CREATED A PROBLEM FOR THE USER IN SELECTING A DATA MODEL WHICH IS IN SOME SENSE APPROPRIATE TO A GIVEN APPLICATION. AN EVALUATION PROCEDURE IS NEEDED WHICH WILL ALLOW THE USER TO EVALUATE ALTERNATIVE MODELS IN THE CONTEXT OF A SPECIFIC SET OF APPLICATIONS. THIS PAPER TAKES A FIRST STEP TOWARD SUCH A PROCEDURE BY IDENTIFYING THE ATTRIBUTES OF A DATA MODEL WHICH CAN BE USED AS CRITERIA FOR EVALUATION THE MODEL. TWO KINDS OF CRITERIA ARE PRESENTED: USE CRITERIA, WHICH MEASURE THE USABILITY OF THE MODEL; AND IMPLEMENTATION CRITERIA, WHICH MEASURE THE IMPLEMENTABILITY OF THE MODEL AND THE EFFICIENCY OF THE RESULTING IMPLEMENTATION. THE USE OF THE CRITERIA IS ILLUSTRATED BY APPLYING THEM TO THREE SPECIFIC MODELS: AN N-ARY RELATIONAL MODEL, A HIERARCHIC MODEL, AND A NETWORK MODEL.

KEYWORDS:

DATA MODEL * DATA MODEL EVALUATION * DATA MODEL SELECTION *
RELATIONAL MODEL * HIERARCHIC MODEL * NETWORK MODEL

CATEGORIES:

4.20 * 4.33 * 4.34

REFERENCE CODE: 12

JOURNAL:

TODS

VOLUME: 2

ISSUE: 1

DATE: MARCH 1977

PAGES: 45 - 67

TITLE:

AN ATTRIBUTE BASED MODEL FOR DATABASE ACCESS COST ANALYSIS

AUTHOR(s):

YAO, S. B.

AFFILIATION:

PURDUE UNIVERSITY

ABSTRACT:

A GENERALIZED MODEL FOR PHYSICAL DATABASE ORGANIZATIONS IS PRESENTED. EXISTING DATABASE ORGANIZATIONS ARE SHOWN TO FIT EASILY INTO THE MODEL AS SPECIAL CASES. GENERALIZED ACCESS ALGORITHMS AND COST EQUATIONS ASSOCIATED WITH THE MODEL ARE DEVELOPED AND ANALYZED. THE MODEL PROVIDES A GENERAL DESIGN FRAMEWORK IN WHICH THE DISTINGUISHING PROPERTIES OF DATABASE ORGANIZATIONS ARE MADE EXPLICIT AND THEIR PERFORMANCES CAN BE COMPARED.

KEYWORDS:

DATABASE ORGANIZATION * INDEX ORGANIZATION * DATABASE
PERFORMANCE EVALUATION * DATABASE MODEL * INVERTED FILE *
MULTILIST * INDEX SEQUENTIAL * B-TREE

CATEGORIES:

3.70 * 3.72 * 3.73 * 3.74 * 4.33

REFERENCE CODE: 13

JOURNAL:

TODS

VOLUME: 2

ISSUE: 1
DATE: MARCH 1977
PAGES: 68 - 90

TITLE:
MINIMUM COST SELECTION OF SECONDARY INDEXES FOR FORMATTED FILES

AUTHOR(s):
ANDERSON, HENRY D. * BERRA, P. BRUCE

AFFILIATION:
SYRACUSE UNIVERSITY

ABSTRACT:
SECONDARY INDEXES ARE OFTEN USED IN DATABASE MANAGEMENT SYSTEMS FOR SECONDARY KEY RETRIEVAL. ALTHOUGH THEIR USE CAN IMPROVE RETRIEVAL TIME SIGNIFICANTLY, THE COST OF INDEX MAINTENANCE AND STORAGE INCREASES THE OVERHEAD OF THE FILE PROCESSING APPLICATION. THE OPTIMAL SET OF INDEXED SECONDARY KEYS FOR A PARTICULAR APPLICATION DEPENDS ON A NUMBER OF APPLICATION DEPENDENT FACTORS. IN THIS PAPER A COST FUNCTION IS DEVELOPED FOR THE EVALUATION OF CANDIDATE INDEXING CHOICES AND APPLIED TO THE OPTIMIZATION OF INDEX SELECTION. FACTORS ACCOUNTED FOR INCLUDE FILE SIZE, THE RELATIVE RATES OF RETRIEVAL AND MAINTENANCE OVER THE CANDIDATE KEYS, INDEX STRUCTURE, AND SYSTEM CHARGING RATES. AMONG THE RESULT DEMONSTRATED ARE THE INCREASED EFFECTIVENESS OF SECONDARY INDEXES FOR LARGE FILE, THE EFFECT OF THE RELATIVE RATES OF RELATIVE RATES OF RETRIEVAL AND MAINTENANCE THE GREATER COST OF ALLOWING FOR ARBITRARILY FORMULATED QUERIES, AND THE IMPACT ON COST OF THE USE OF DIFFERENT INDEX STRUCTURES.

KEYWORDS:
SECONDARY INDEX * SECONDARY KEY * INVERTED INDEX * INVERTED FILE * SECONDARY KEY ACCESS * DATABASE * DATA MANAGEMENT * FILE DESIGN, RETRIEVAL * RETRIEVAL * MAINTENANCE FILE ORGANIZATION * OPTIMIZATION * ACCESS METHODS * ACCESS PATH * BOOLEAN QUERY * COST FUNCTION

CATEGORIES:
3.50 * 3.72 * 3.74 * 4.33 * 4.34

REFERENCE CODE: 14

JOURNAL:
TODS
VOLUME: 2
ISSUE: 2
DATE: JUNE 1977
PAGES: 175 - 195

TITLE:
PERFORMANCE EVALUATION OF A RELATIONAL ASSOCIATIVE PROCESSOR

AUTHOR(s):
OZKARAHAN, E. A. * SCHUSTER, S. A. * SEVCIK, K. C.

AFFILIATION:
UNIVERSITY OF TORONTO, CANADA

ABSTRACT:
AN ASSOCIATIVE PROCESSOR CALLED RAP HAS BEEN DESIGNED TO PROVIDE HARDWARE SUPPORT FOR THE USE AND MANIPULATION OF DATABASES. RAP IS PARTICULARLY SUITED FOR SUPPORTING RELATIONAL DATABASES. IN THIS PAPER, THE RELATIONAL OPERATIONS PROVIDED BY THE RAP HARDWARE ARE DESCRIBED, AND A REPRESENTATIVE APPROACH TO PROVIDING THE SAME RELATIONAL OPERATIONS WITH CONVENTIONAL SOFTWARE AND HARDWARE IS DEvised. ANALYTIC MODELS ARE CONSTRUCTED FOR RAP AND THE CONVENTIONAL SYSTEM. THE EXECUTION TIMES OF SEVERAL OF THE OPERATIONS ARE SHOWN TO BE VASTLY IMPROVED WITH RAP FOR LARGE RELATIONS.

KEYWORDS:
DATABASE MACHINES * ASSOCIATIVE PROCESSORS * PERFORMANCE EVALUATION * RELATIONAL DATABASES.

CATEGORIES:
3.7 * 4.33 * 4.6 * 6.22 * 8.1

REFERENCE CODE: 15

JOURNAL:
TODS
VOLUME: 2
ISSUE: 2
DATE: JUNE 1977
PAGES: 196 - 207

TITLE:
AN EXTENSION OF THE PERFORMANCE OF A DATABASE MANAGER IN A VIRTUAL MEMORY SYSTEM USING PARTIALLY LOCKED VIRTUAL BUFFERS

AUTHOR(s):
BRICE, RICHARD S. * SHERMAN, STEPHEN W.

AFFILIATION:
THE GEORGE WASHINGTON UNIVERSITY * UNIVERSITY OF NEVADA, LAS VEGAS

ABSTRACT:

BUFFER POOLS ARE CREATED AND MANAGED IN DATABASE SYSTEMS IN ORDER TO REDUCE THE TOTAL NUMBER OF ACCESSES TO THE I/O DEVICES. IN SYSTEMS USING VIRTUAL MEMORY, ANY REDUCTION IN I/O ACCESSES MAY BE ACCOMPANIED BY AN INCREASE IN PAGING. THE EFFECTS OF THESE FACTORS ON SYSTEM PERFORMANCE ARE QUANTIFIED, WHERE SYSTEM PERFORMANCE IS A FUNCTION OF PAGE FAULTS AND DATABASE ACCESSES TO THE I/O DEVICES. A PREVIOUS STUDY OF THIS PHENOMENON IS EXTENDED THROUGH THE ANALYSIS OF EMPIRICAL DATA GATHERED IN A MULTIFACTOR EXPERIMENT. IN THIS STUDY MEMORY IS PARTITIONED BETWEEN THE PROGRAM AND THE BUFFER SO THAT THE IMPACT OF THE CONTROLLED FACTORS CAN BE MORE EFFECTIVELY EVALUATED. IT IS POSSIBLE TO IMPROVE SYSTEM PERFORMANCE THROUGH THE USE OF DIFFERENT PAGING ALGORITHMS IN THE PROGRAM PARTITION AND THE BUFFER PARTITION. ALSO, THE EFFECTS ON SYSTEM PERFORMANCE AS THE VIRTUAL BUFFER SIZE IS INCREASED BEYOND THE REAL MEMORY ALLOCATED TO THE BUFFER PARTITION ARE INVESTIGATED.

KEYWORDS:

PERFORMANCE * DATABASE MANAGEMENT * VIRTUAL MEMORY * DOUBLE PAGING * VIRTUAL BUFFER * PAGING FAULTS * PAGE REPLACEMENT ALGORITHM * BUFFER MANAGER * LOCKED BUFFER

CATEGORIES:

3.72 * 4.3 * 4.33 * 4.35 * 4.6

REFERENCE CODE: 16

JOURNAL:

TODS

VOLUME: 3

ISSUE: 1

DATE: MARCH 1978

PAGES: 1 - 31

TITLE:

SEARCH STRATEGY AND SELECTION FUNCTION FOR AN INFERENTIAL RELATIONAL SYSTEM

AUTHOR(s):

MINKER, JACK

AFFILIATION:

UNIVERSITY OF MARYLAND

ABSTRACT:

AN INFERENTIAL RELATIONAL SYSTEM IS ONE IN WHICH DATA IN THE SYSTEM CONSISTS OF BOTH EXPLICIT FACTS AND GENERAL AXIOMS (OR "VIEWS"). THE GENERAL AXIOMS ARE USED TOGETHER WITH THE EXPLICIT FACTS TO DERIVE THE FACTS THAT ARE IMPLICIT (VIRTUAL RELATIONS) WITHIN THE SYSTEM. A TOP-DOWN ALGORITHM,

AS USED IN ARTIFICIAL INTELLIGENCE WORK, IS DESCRIBED TO DEVELOP INFERENCES WITHIN THE SYSTEM. THE TOP-DOWN APPROACH STARTS WITH THE QUERY, A CONJUNCTION OF RELATIONS, TO BE ANSWERED. EITHER A RELATIONAL FACT SOLVES A GIVEN RELATION IN A CONJUNCT, OR THE RELATION IS REPLACED BY A CONJUNCT OF RELATIONS WHICH MUST BE SOLVED TO SOLVE THE GIVEN RELATION. THE APPROACH REQUIRES THAT ONE AND ONLY ONE RELATION IN A CONJUNCTION BE REPLACED (OR EXPANDED) BY THE GIVEN FACTS AND GENERAL AXIOMS. THE DECISION TO EXPAND ONLY A SINGLE RELATION IS TERMED A SELECTION FUNCTION. IT IS SHOWN FOR RELATIONAL SYSTEMS THAT SUCH A RESTRICTION STILL GUARANTEES THAT A SOLUTION TO THE PROBLEM WILL BE FOUND IF ONE EXISTS. THE ALGORITHM PROVIDES FOR HEURISTIC DIRECTION IN THE SEARCH PROCESS. EXPERIMENTAL RESULTS ARE PRESENTED WHICH ILLUSTRATE THE TECHNIQUES. A BOOKKEEPING MECHANISM IS DESCRIBED WHICH PERMITS ONE TO KNOW WHEN SUBPROBLEMS ARE SOLVED. IT FURTHER FACILITATES THE OUTPUTTING OF REASONS FOR THE DEDUCTIVELY FOUND ANSWER IN A COHERENT FASHION.

KEYWORDS:

ANSWER AND REASON EXTRACTION * HEURISTICS * INFERENCE
MECHANISM * LOGIC PREDICATE CALCULUS * RELATIONAL DATABASES
* SEARCH STRATEGY * SELECTION FUNCTION * TOP-DOWN SEARCH *
VIRTUAL RELATIONS

CATEGORIES:

3.60 * 4.33

REFERENCE CODE: 17

JOURNAL:

TODS

VOLUME: 3

ISSUE: 1

DATE: MARCH 1978

PAGES: 32 - 40

TITLE:

OPTIMUM REORGANIZATION POINTS FOR LINEARLY GROWING FILES

AUTHOR(s):

TUEL, WILLIAM G. JR.

AFFILIATION:

IBM CORPORATION

ABSTRACT:

THE PROBLEM OF FINDING OPTIMAL REORGANIZATION INTERVALS FOR LINEARLY GROWING FILES IS SOLVED. AN APPROXIMATE REORGANIZATION POLICY, INDEPENDENT OF FILE LIFETIME, IS OBTAINED. BOTH THE OPTIMUM AND APPROXIMATE POLICIES ARE

COMPARED TO PREVIOUSLY PUBLISHED RESULTS USING A NUMERICAL
EXAMPLE.

KEYWORDS:

DATABASE * FILE ORGANIZATION * REORGANIZATION * OPTIMIZATION

CATEGORIES:

2.43 * 3.73 * 4.33

REFERENCE CODE: 18

JOURNAL:

TODS

VOLUME: 3

ISSUE: 1

DATE: MARCH 1978

PAGES: 57 - 91

TITLE:

CASDAL: CASSM'S DATA LANGUAGE

AUTHOR(s):

SU, STANLEY Y. W. * EMAN, AHMED

AFFILIATION:

UNIVERSITY OF FLORIDA, GAINESVILLE, FLORIDA

ABSTRACT:

CASDAL IS A HIGH LEVEL DATA LANGUAGE DESIGNED AND IMPLEMENTED FOR THE DATABASE MACHINE CASSM. THE LANGUAGE IS USED FOR THE MANIPULATION AND MAINTENANCE OF A DATABASE USING AN UNNORMALIZED (HIERARCHICALLY STRUCTURED) RELATIONAL DATA MODEL. IT ALSO HAS FACILITIES TO DEFINE, MODIFY, AND MAINTAIN THE DATA MODEL DEFINITION. THE UNIQUENESS OF CASDAL LIES IN ITS POWER TO SPECIFY COMPLEX OPERATIONS IN TERMS OF SEVERAL NEW LANGUAGE CONSTRUCTS AND ITS CONCEPT OF TAGGING OR MARKING TUPLES AND OF MATCHING VALUES WHEN WALKING FROM RELATION TO RELATION. THE LANGUAGE IS A RESULT OF A TOP-DOWN DESIGN AND DEVELOPMENT EFFORT FOR A DATABASE MACHINE IN WHICH HIGH LEVEL LANGUAGE CONSTRUCTS ARE DIRECTLY SUPPORTED BY THE HARDWARE. THIS PAPER (1) GIVES JUSTIFICATIONS FOR THE USE OF AN UNNORMALIZED RELATIONAL MODEL ON WHICH THE LANGUAGE IS BASED, (2) PRESENTS THE CASDAL LANGUAGE CONSTRUCTS WITH EXAMPLES, AND (3) DESCRIBES CASSM'S ARCHITECTURE AND FACILITATE THE TRANSLATION PROCESS. THIS PAPER ALSO ATTEMPTS TO SHOW HOW THE EFFICIENCY OF THE LANGUAGE AND THE TRANSLATION TASK CAN BE ACHIEVED AND SIMPLIFIED IN A SYSTEM IN WHICH THE LANGUAGE IS THE RESULT OF A TOP-DOWN SYSTEM DESIGN AND DEVELOPMENT.

KEYWORDS:

QUERY LANGUAGE * RELATIONAL MODEL * ASSOCIATIVE MEMORY *
DATABASE NON-PROCEDURAL LANGUAGE

CATEGORIES:

3.74 * 3.75 * 4.22 * 4.33 * 4.34 * 5.31

REFERENCE CODE: 19

JOURNAL:

TODS

VOLUME: 3

ISSUE: 4

DATE: DECEMBER 1978

PAGES: 417 - 439

TITLE:

IMPROVING THE HUMAN FACTORS ASPECT OF DATABASE INTERACTIONS

AUTHOR(s):

SHNEIDERMAN, BEN

AFFILIATION:

UNIVERSITY OF MARYLAND

ABSTRACT:

THE WIDESPREAD DISSEMINATION OF COMPUTER AND INFORMATION SYSTEMS TO NONTECHNICALLY TRAINED INDIVIDUALS REQUIRES A NEW APPROACH TO THE DESIGN AND DEVELOPMENT OF DATABASE INTERFACES. THIS PAPER PROVIDES THE MOTIVATIONAL BACKGROUND FOR CONTROLLED PSYCHOLOGICAL EXPERIMENTATION IN EXPLORING THE PERSON/MACHINE INTERFACE. FRAMEWORKS FOR THE REDUCTIONIST APPROACH ARE GIVEN, RESEARCH METHODS DISCUSSED, RESEARCH ISSUES PRESENTED, AND A SMALL EXPERIMENT IS OFFERED AS AN EXAMPLE OF WHAT CAN BE ACCOMPLISHED. THIS EXPERIMENT IS A COMPARISON OF NATURAL AND ARTIFICIAL LANGUAGE QUERY FACILITIES. ALTHOUGH SUBJECTS POSED APPROXIMATELY EQUAL NUMBERS OF VALID QUERIES WITH EITHER FACILITY, NATURAL LANGUAGE USERS MADE SIGNIFICANTLY MORE INVALID QUERIES WHICH COULD NOT BE ANSWERED FROM THE DATABASE THAT WAS DESCRIBED.

KEYWORDS:

HUMAN FACTORS * DATABASE SYSTEMS * DATA MODELS * QUERY LANGUAGES * NATURAL LANGUAGE INTERFACES * PSYCHOLOGY * EXPERIMENTATION

CATEGORIES:

4.33 * 4.6 * 3.72

REFERENCE CODE: 20

JOURNAL:
TODS
VOLUME: 3
ISSUE: 4
DATE: DECEMBER 1978
PAGES: 440 - 445

TITLE:
THE DIFFICULTY OF OPTIMUM INDEX SELECTION

AUTHOR(s):
COMER, DOUGLAS

AFFILIATION:
PURDUE UNIVERSITY

ABSTRACT:
GIVEN A FILE ON A SECONDARY STORE IN WHICH EACH RECORD HAS SEVERAL ATTRIBUTES, IT IS USUALLY ADVANTAGEOUS TO BUILD AN INDEX MECHANISM TO DECREASE THE COST OF CONDUCTING TRANSACTIONS TO THE FILE. THE PROBLEM OF SELECTING ATTRIBUTES OVER WHICH TO INDEX HAS BEEN STUDIED IN THE CONTEXT OF VARIOUS STORAGE STRUCTURES AND ACCESS ASSUMPTIONS. ONE ALGORITHM TO MAKE AN OPTIMUM INDEX SELECTION REQUIRES $2 \cdot K$ STEPS IN THE WORST CASE, WHERE K IS THE NUMBER OF ATTRIBUTES IN THE FILE. WE EXAMINE THE QUESTION OF WHETHER A MORE EFFICIENT ALGORITHM MIGHT EXIST AND SHOW THAT EVEN UNDER A SIMPLE COST CRITERION THE PROBLEM IS COMPUTATIONALLY DIFFICULT IN A PRECISE SENSE. OUR RESULTS EXTEND DIRECTLY TO OTHER RELATED PROBLEMS WHERE THE COST OF INDEX DEPENDS ON FIXED VALUES WHICH ARE ASSIGNED TO EACH ATTRIBUTE. SOME PRACTICAL IMPLICATIONS ARE DISCUSSED.

KEYWORDS:
ATTRIBUTE SELECTION * SECONDARY INDEX * INDEX SELECTION * COMPLEXITY

CATEGORIES:
3.73 * 3.74 * 4.33 * 4.34

REFERENCE CODE: 21

JOURNAL:
TODS
VOLUME: 4
ISSUE: 2
DATE: JUNE 1979
PAGES: 133 - 155

TITLE:

OPTIMIZATION OF QUERY EVALUATION ALGORITHMS

AUTHOR(s):
YAO, S. BING

AFFILIATION:
PURDUE UNIVERSITY

ABSTRACT:
A MODEL OF DATABASE STORAGE AND ACCESS IS PRESENTED. THE MODEL REPRESENTS MANY EVALUATION ALGORITHMS AS SPECIAL CASES, AND HELPS TO BREAK A COMPLEX ALGORITHM INTO SIMPLE ACCESS OPERATIONS. GENERALIZED ACCESS COST EQUATIONS ASSOCIATED WITH THE MODEL ARE DEVELOPED AND ANALYZED. OPTIMIZATION OF THESE COST EQUATIONS YIELDS AN OPTIMAL ACCESS ALGORITHM WHICH CAN BE SYNTHESIZED BY A QUERY SYSTEM WHOSE DESIGN IS BASED ON THE MODULAR ACCESS OPERATIONS.

KEYWORDS:
RELATIONAL DATA MODEL * QUERY LANGUAGE * DATA MANIPULATION LANGUAGE * QUERY OPTIMIZATION * DATABASE OPTIMIZATION * INVERTED FILE

CATEGORIES:
3.70 * 3.72 * 3.74 * 4.33

REFERENCE CODE: 22

JOURNAL:
TODS
VOLUME: 4
ISSUE: 2
DATE: JUNE 1979
PAGES: 228 - 239

TITLE:
PARTIAL-MATCH HASH CODING: BENEFITS OF REDUNDANCY

AUTHOR(s):
BURKHARD, WALTER A.

AFFILIATION:
UNIVERSITY OF CALIFORNIA, SAN DIEGO

ABSTRACT:
FILE DESIGNS SUITABLE FOR RETRIEVAL FROM A FILE OF K-FIELD RECORDS WHEN QUERIES MAY BE PARTIALLY SPECIFIED ARE EXAMINED. STORAGE REDUNDANCY IS INTRODUCED TO OBTAIN IMPROVED WORST-CASE AND AVERAGE-CASE PERFORMANCES. THE RESULTING STORAGE SCHEMES ARE APPROPRIATE FOR REPLICATED DISTRIBUTED DATABASE ENVIRONMENTS; IT IS POSSIBLE TO IMPROVE

THE OVERALL AVERAGE AND WORST-CASE BEHAVIOR FOR QUERY RESPONSE AS WELL AS PROVIDE AN ENVIRONMENT WITH VERY HIGH RELIABILITY. WITHIN PRACTICAL SYSTEMS IT WILL BE POSSIBLE TO IMPROVE THE QUERY RESPONSE TIME PERFORMANCE AS WELL AS RELIABILITY OVER COMPARABLE SYSTEMS WITHOUT REPLICATION.

KEYWORDS:

ALGORITHMS * ANALYSIS * SEARCHING * DATA STRUCTURES *
DATABASE SYSTEMS * REPLICATION * ACCESS METHODS

CATEGORIES:

3.72 * 3.74 * 4.33 * 5.0 * 5.25

REFERENCE CODE: 23

JOURNAL:

TODS

VOLUME: 5

ISSUE: 1

DATE: MARCH 1980

PAGES: 69 - 87

TITLE:

PERFORMANCE EVALUATION OF ATTRIBUTE-BASED TREE ORGANIZATION

AUTHOR(s):

GOPALAKRISHNA, V. * MADHAVAN, C. E. VENI

AFFILIATION:

NATIONAL INFORMATION CENTRE, INDIA

ABSTRACT:

A MODIFIED VERSION OF THE MULTIPLE ATTRIBUTE TREE (MAT) DATABASE ORGANIZATION, WHICH USES A COMPACT DIRECTORY, IS DISCUSSED. AN EFFICIENT ALGORITHM TO PROCESS THE DIRECTORY FOR CARRYING OUT THE NODE SEARCHES IS PRESENTED. STATISTICAL PROCEDURES ARE DEVELOPED TO ESTIMATE THE NUMBER OF NODES SEARCHED AND THE NUMBER OF DATA BLOCKS RETRIEVED FOR MOST GENERAL AND COMPLEX QUERIES. THE PERFORMANCE OF INVERTED FILE AND MODIFIED MAT ORGANIZATIONS ARE COMPARED USING SIX REAL-LIFE DATABASES AND FOUR TYPES OF QUERY COMPLEXITIES. CAREFUL TRADEOFFS ARE ESTABLISHED IN TERMS OF STORAGE AND ACCESS TIMES FOR DIRECTORY AND DATA, QUERY COMPLEXITIES, AND DATABASE CHARACTERISTICS.

KEYWORDS:

AVERAGE RETRIEVAL TIME PER QUERY * DATABASE ORGANIZATION *
DATABASE PERFORMANCE * DIRECTORY SEARCH TIME * MODIFIED
MULTIPLE ATTRIBUTE TREE * SECONDARY INDEX ORGANIZATION *
QUERY COMPLEXITY * ACCESS TIME

CATEGORIES:

3.70 * 3.72 * 3.73 * 3.74 * 4.33

REFERENCE CODE: 24

JOURNAL:

TODS

VOLUME: 6

ISSUE: 4

DATE: DECEMBER 1981

PAGES: 626 - 649

TITLE:

HUMAN FACTORS COMPARISON OF A PROCEDURAL AND A NONPROCEDURAL
QUERY LANGUAGE

AUTHOR(s):

WELTY, CHARLS * STEMPEL, DAVID W.

AFFILIATION:

UNIVERSITY OF SOUTHERN MAINE * UNIVERSITY OF MASSACHUSETTS

ABSTRACT:

TWO EXPERIMENTS TESTING THE ABILITY OF SUBJECTS TO WRITE
QUERIES IN TWO DIFFERENT QUERY LANGUAGES WERE RUN. THE TWO
LANGUAGES, AQL AND TABLET, DIFFER PRIMARILY IN THEIR
PROCEDURALITY; BOTH LANGUAGES USE THE RELATIONAL DATA MODEL,
AND THEIR HALSTEAD LEVELS ARE SIMILAR. CONSTRUCTS IN THE
LANGUAGES WHICH DO NOT AFFECT THEIR PROCEDURALITY ARE
IDENTICAL. THE TWO LANGUAGES WERE LEARNED BY THE
EXPERIMENTAL SUBJECTS ALMOST EXCLUSIVELY FROM MANUALS
PRESENTING THE SAME EXAMPLES AND PROBLEMS ORDERED
IDENTICALLY FOR BOTH LANGUAGES. THE RESULTS OF THE
EXPERIMENTS SHOW THAT SUBJECTS USING THE MORE PROCEDURAL
LANGUAGE WROTE DIFFICULT QUERIES BETTER THAN SUBJECTS USING
THE LESS PROCEDURAL LANGUAGE. THE RESULTS OF THE EXPERIMENTS
ARE USED TO COMPARE CORRESPONDING CONSTRUCTS IN THE TWO
LANGUAGES AND TO RECOMMEND IMPROVEMENTS FOR THESE
CONSTRUCTS.

KEYWORDS:

HUMAN FACTORS * DATABASE SYSTEMS * QUERY LANGUAGES *
PROCEDURAL AND NON-PROCEDURAL LANGUAGES

CATEGORIES:

3.72 * 4.33 * 4.6

REFERENCE CODE: 25

JOURNAL:
TODS
VOLUME: 7
ISSUE: 1
DATE: MARCH 1982
PAGES: 60 - 81

TITLE:
OPTIMAL FILE DESIGNS AND REORGANIZATION POINTS

AUTHOR(s):
BATORY, D. S.

AFFILIATION:
UNIVERSITY OF TORONTO, CANADA

ABSTRACT:
A MODEL FOR STUDYING THE COMBINED PROBLEMS OF FILE DESIGN AND FILE ORGANIZATION IS PRESENTED. NEW MODELING TECHNIQUES FOR PREDICTING THE PERFORMANCE EVALUATION OF FILES AND FOR FINDING OPTIMAL REORGANIZATION POINTS FOR FILES ARE INTRODUCED. APPLICATIONS OF THE MODEL TO HASH-BASED AND INDEXED-SEQUENTIAL FILES REVEAL IMPORTANT RELATIONSHIPS BETWEEN INITIAL LOADING FACTORS AND REORGANIZATION FREQUENCY. A PRACTICAL FILE DESIGN STRATEGY, BASED ON THESE RELATIONSHIPS, IS PROPOSED.

KEYWORDS:
DESIGN * PERFORMANCE * FILE DESIGN * FILE REORGANIZATION

CATEGORIES:
4.34 * 4.6 * 5.9

REFERENCE CODE: 26

JOURNAL:
TODS
VOLUME: 7
ISSUE: 4
DATE: DECEMBER 1982
PAGES: 566 - 587

TITLE:
PERFORMANCE ANALYSIS OF LINEAR HASHING WITH PARTIAL EXPANSIONS

AUTHOR(s):
LARSON, PER-AKE

AFFILIATION:
ABO AKADEMI, FINLAND

ABSTRACT:

LINEAR HASHING WITH PARTIAL EXPANSIONS IS A NEW FILE ORGANIZATION PRIMARILY INTENDED FOR FILES WHICH GROW AND SHRINK DYNAMICALLY. THIS PAPER PRESENTS A MATHEMATICAL ANALYSIS OF THE EXPECTED PERFORMANCE OF THE NEW SCHEME. THE FOLLOWING PERFORMANCE MEASURES ARE CONSIDERED: LENGTH OF SUCCESSFUL AND UNSUCCESSFUL SEARCHES, ACCESSES REQUIRED TO INSERT OR DELETE A RECORD, AND THE SIZE OF THE OVERFLOW AREA. THE PERFORMANCE IS CYCLICAL. FOR ALL PERFORMANCE MEASURES, THE NECESSARY FORMULAS ARE DERIVED FOR COMPUTING THE EXPECTED PERFORMANCE AT ANY POINT OF A CYCLE AND THE AVERAGE OVER A CYCLE. FURTHERMORE, THE EXPECTED WORST CASE IN CONNECTION WITH SEARCHING IS ANALYZED. THE OVERALL PERFORMANCE DEPENDS ON SEVERAL FILE PARAMETERS. THE NUMERICAL RESULTS SHOW THAT FOR MANY REALISTIC PARAMETER COMBINATIONS THE PERFORMANCE IS EXPECTED TO BE EXTREMELY GOOD. EVEN THE LONGEST SEARCH IS EXPECTED TO BE OF QUITE REASONABLE LENGTH.

KEYWORDS:

ALGORITHMS * PERFORMANCE * HASHING * DYNAMIC HASHING SCHEMES
* LINEAR HASHING * EXTENDIBLE HASHING

CATEGORIES:

3.7 * 4.6 * 5.41

REFERENCE CODE: 27

JOURNAL:

TODS

VOLUME: 7

ISSUE: 4

DATE: DECEMBER 1982

PAGES: 615 - 631

TITLE:

MATHEMATICAL MODELS OF DATABASE DEGRADATION

AUTHOR(s):

HEYMAN, DANIEL P.

AFFILIATION:

BELL LABORATORIES

ABSTRACT:

AS DATA ARE UPDATED, THE INITIAL PHYSICAL STRUCTURE OF A DATABASE IS CHANGED AND RETRIEVAL OF SPECIFIC PIECES OF DATA BECOMES MORE TIME CONSUMING. THIS PHENOMENON IS CALLED DATABASE DEGRADATION. IN THIS PAPER TWO MODELS OF DATABASE DEGRADATION ARE DESCRIBED. EACH MODEL REFERS TO A DIFFERENT

ASPECT OF THE PROBLEM. IT IS ASSUMED THAT TRANSACTIONS ARE STATISTICALLY INDEPENDENT AND EITHER ADD, DELETE, OR UPDATE DATA. THE FIRST MODEL EXAMINES THE TIME DURING WHICH A BLOCK OF DATA IS FILLING UP. THE SECOND MODEL EXAMINES THE OVERFLOWS FROM A BLOCK OF DATA, WHICH ESSENTIALLY DESCRIBES THE BUILDUP OF DISORGANIZATION. ANALYTICAL RESULTS ARE OBTAINED FOR BOTH MODELS. IN ADDITION, SEVERAL NUMERICAL EXAMPLES ARE PRESENTED WHICH SHOW THAT THE MEAN NUMBER OF OVERFLOWS GROWS APPROXIMATELY LINEARLY WITH TIME. THIS APPROXIMATION IS USED TO DEVISE A SIMPLE FORMULA FOR THE OPTIMAL TIME TO REORGANIZE A STOCHASTICALLY GROWING DATABASE.

KEYWORDS:

PERFORMANCE * DATA OVERFLOWS * FILE ORGANIZATION

CATEGORIES:

3.7 * 4.33 * 5.12

REFERENCE CODE: 28

JOURNAL:

TODS

VOLUME: 8

ISSUE: 3

DATE: SEPTEMBER 1983

PAGES: 291-323

TITLE:

PERFORMANCE OF RECOVERY ARCHITECTURES IN PARALLEL ASSOCIATIVE DATABASE PROCESSORS

AUTHOR(s):

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AFFILIATION:

UNIVERSITY OF CALIFORNIA, LOS ANGELES * COMPUTER SCIENCE CORPORATION

ABSTRACT:

THE NEED FOR ROBUST RECOVERY FACILITIES IN MODERN DATABASE MANAGEMENT SYSTEMS IS QUITE WELL KNOWN. VARIOUS AUTHORS HAVE ADDRESSED RECOVERY FACILITIES AND SPECIFIC TECHNIQUES, BUT NONE HAVE DELVED INTO THE PROBLEM OF RECOVERY IN DATABASE MACHINES. IN THIS PAPER, THE TYPES OF UNDESIRABLE EVENTS THAT OCCUR IN A DATABASE ENVIRONMENT ARE CLASSIFIED AND THE NECESSARY RECOVERY INFORMATION, WITH SUBSEQUENT ACTIONS TO RECOVER THE CORRECT STATE OF THE DATABASE, IS SUMMARIZED. A MODEL OF THE "PROCESSOR- PER-TRACK" CLASS OF PARALLEL ASSOCIATIVE DATABASE PROCESSOR IS PRESENTED. THREE DIFFERENT TYPES OF RECOVERY MECHANISMS THAT MAY BE CONSIDERED FOR

PARALLEL ASSOCIATIVE DATABASE PROCESSORS ARE IDENTIFIED. FOR EACH ARCHITECTURE, BOTH THE WORKLOAD IMPOSED BY THE RECOVERY MECHANISMS ON THE EXECUTION OF DATABASE OPERATIONS (I.E., RETRIEVE, MODIFY, DELETE, AND INSERT) AND THE WORKLOAD INVOLVED IN THE RECOVERY ACTIONS (I.E., ROLLBACK, RESTART, RESTORE, AND RECONSTRUCT) ARE ANALYZED. THE PERFORMANCE OF THE THREE ARCHITECTURES IS QUANTITATIVELY COMPARED. THIS COMPARISON IS MADE IN TERMS OF THE NUMBER OF EXTRA REVOLUTIONS OF THE DATABASE AREA REQUIRED TO PROCESS A TRANSACTION VERSUS THE NUMBER OF RECORDS AFFECTED BY A TRANSACTION. A VARIETY OF DIFFERENT DESIGN PARAMETERS OF THE DATABASE PROCESSOR, OF THE DATABASE, AND OF A MIX OF TRANSACTION TYPES (MODIFY, INSERT, AND DELETE) ARE CONSIDERED. A LARGE NUMBER OF COMBINATIONS IS SELECTED AND THE EFFECTS OF THE PARAMETERS ON THE EXTRA PROCESSING TIME ARE IDENTIFIED.

KEYWORDS:

DESIGN * PERFORMANCE * ASSOCIATIVE DATABASE PROCESSORS

CATEGORIES:

3.7 * 4.1 * 4.3 * 4.33

REFERENCE CODE: 29

JOURNAL:

TODS

VOLUME: 8

ISSUE: 3

DATE: SEPTEMBER 1983

PAGES: 410 - 433

TITLE:

HIERARCHICAL FILE ORGANIZATION AND ITS APPLICATION TO
SIMILAR-STRING MATCHING

AUTHOR(s):

ITO, TETSURO * KIZAWA, MAKOTO

AFFILIATION:

UNIVERSITY OF LIBRARY AND INFORMATION SCIENCE, IBARAKI, JAPAN

ABSTRACT:

THE AUTOMATIC CORRECTION OF MISSPELLED INPUTS IS DISCUSSED FROM A VIEWPOINT OF SIMILAR-STRING MATCHING. FIRST A HIERARCHICAL FILE ORGANIZATION BASED ON A LINEAR ORDERING OF RECORDS IS PRESENTED FOR RETRIEVING RECORDS HIGHLY SIMILAR TO ANY INPUT QUERY. THEN THE SPELLING PROBLEM IS ATTACKED BY CONSTRUCTING A HIERARCHICAL FILE FOR A SET OF STRINGS IN A DIRECTORY OF ENGLISH WORDS. THE SPELLING CORRECTION STEPS PROCEED AS FOLLOWS: (1) FIND ONE OF THE BEST-MATCH STRINGS

WHICH ARE MOST SIMILAR TO A QUERY, (2) EXPAND THE SEARCH AREA FOR OBTAINING THE GOOD-MATCH STRINGS, AND (3) INTERRUPT THE FILE SEARCH AS SOON AS THE REQUIRED STRING IS DISPLAYED. COMPUTATIONAL EXPERIMENTS VERIFY THE PERFORMANCE OF THE PROPOSED METHODS FOR SIMILAR STRING MATCHING UNDER THE UNIX TIME-SHARING SYSTEM.

KEYWORDS:

ALGORITHMS * EXPERIMENTATION * PERFORMANCE * FILE ORGANIZATION * HIERARCHICAL CLUSTERING * LINEAR ORDERING * BEST MATCH * GOOD MATCH * SPELLING CORRECTION * SIMILAR-STRING * TEXT EDITOR

CATEGORIES:

3.6 * 3.7 * 4.1 * 4.34

REFERENCE CODE: 30

JOURNAL:

TODS

VOLUME: 8

ISSUE: 3

DATE: SEPTEMBER 1983

PAGES: 434 - 464

TITLE:

INDEXING AND RETRIEVAL STRATEGIES FOR NATURAL LANGUAGE FACT RETRIEVAL

AUTHOR(s):

KOLODNER, JANET L.

AFFILIATION:

GEORGIA INSTITUTE OF TECHNOLOGY

ABSTRACT:

RESEARCHERS IN ARTIFICIAL INTELLIGENCE HAVE RECENTLY BECOME INTERESTED IN NATURAL LANGUAGE FACT RETRIEVAL; CURRENTLY, THEIR RESEARCH IS AT A POINT WHERE IT CAN BEGIN CONTRIBUTING TO THE FIELD OF INFORMATION RETRIEVAL. IN THIS PAPER, STRATEGIES FOR A NATURAL LANGUAGE FACT RETRIEVAL SYSTEM ARE MAPPED OUT. AND APPROACHES TO MANY OF THE ORGANIZATION AND RETRIEVAL PROBLEMS ARE PRESENTED. THE CYRUS SYSTEM, WHICH KEEPS TRACK OF IMPORTANT PEOPLE AND IS QUERIED IN ENGLISH, IS PRESENTED AND USED TO ILLUSTRATE THOSE SOLUTIONS.

KEYWORDS:

DESIGN * NATURAL LANGUAGE PROCESSING * ARTIFICIAL INTELLIGENCE * FACT RETRIEVAL * CONCEPTUAL MEMORY * DATABASE RETRIEVAL * QUESTION ANSWERING

CATEGORIES:
3.6 * 3.74 * 4.2

REFERENCE CODE: 31

JOURNAL:
TODS
VOLUME: 8
ISSUE: 4
DATE: DECEMBER 1983
PAGES: 543 - 551

TITLE:
ON THE COMPLEXITY OF DESIGNING OPTIMAL PARTIAL-MATCH
RETRIEVAL SYSTEMS

AUTHOR(s):
MORAN, SHLOMO

AFFILIATION:
THE TECHNION --- ISRAEL INSTITUTE OF TECHNOLOGY, HAIFA

ABSTRACT:
WE CONSIDER THE PROBLEM OF DESIGNING AN INFORMATION
RETRIEVAL SYSTEM ON WHICH PARTIAL MATCH QUERIES HAVE TO BE
ANSWERED. EACH RECORD IN THE SYSTEM CONSISTS OF A LIST OF
ATTRIBUTES, AND A PARTIAL MATCH QUERY SPECIFIES THE VALUES
OF SOME OF THE ATTRIBUTES. THE RECORDS ARE STORED IN BUCKETS
IN A SECONDARY MEMORY, AND IN ORDER TO ANSWER A PARTIAL
MATCH QUERY ALL THE BUCKETS THAT MAY CONTAIN A RECORD
SATISFYING THE SPECIFICATIONS OF THE QUERY MUST BE
RETRIEVED. THE BUCKET IN WHICH A GIVEN RECORD IS STORED IS
FOUND BY MULTIPLE KEY HASHING FUNCTION, WHICH MAPS EACH
ATTRIBUTE TO A STRING OF A FIXED NUMBER OF BITS. THE ADDRESS
OF THAT BUCKET IS THEN REPRESENTED BY THE STRING OBTAINED BY
CONCATENATING THE STRINGS ON WHICH THE VARIOUS ATTRIBUTES
WERE MAPPED. A PARTIAL MATCH QUERY MAY SPECIFY ONLY PART OF
THE BITS IN THE STRING REPRESENTING THE ADDRESS, AND THE
LARGER THE THE NUMBER OF BITS SPECIFIED, THE SMALLER THE
NUMBER OF BUCKETS THAT HAVE TO BE RETRIEVED IN ORDER TO
ANSWER THE QUERY. THE OPTIMIZATION PROBLEM CONSIDERED IN
THIS PAPER IS THAT OF DECIDING TO HOW MANY BITS EACH
ATTRIBUTE SHOULD BE MAPPED BY THE HASHING FUNCTION ABOVE, SO
THAT THE EXPECTED NUMBER OF BUCKETS RETRIEVED PER QUERY IS
MINIMIZED. EFFICIENT SOLUTIONS FOR SPECIAL CASES OF THIS
PROBLEM HAVE BEEN OBTAINED IN [1], [12], AND [14]. IT IS
SHOWN THAT IN GENERAL THE PROBLEM IS NP-HARD, AND THAT IF P
◊ NP, IT IS ALSO NOT FULLY APPROXIMABLE. TWO HEURISTIC
ALGORITHMS FOR THE PROBLEM ARE ALSO GIVEN AND COMPARED.

KEYWORDS:

PARTIAL MATCH RETRIEVAL * HASHING * SEARCHING * FILE
ORGANIZATION * NP-HARD PROBLEMS * APPROXIMATION ALGORITHMS

CATEGORIES:

3.74 * 5.12

REFERENCE CODE: 32

JOURNAL:

TODS

VOLUME: 8

ISSUE: 4

DATE: DECEMBER 1983

PAGES: 552 - 576

TITLE:

PARTIAL-MATCH RETRIEVAL USING HASHING AND DESCRIPTORS

AUTHOR(s):

RAMAMOHANARAO, K. * LLOYD, JOHN W. * THOM, JAMES A.

AFFILIATION:

UNIVERSITY OF MELBOURNE

ABSTRACT:

THIS PAPER STUDIES A PARTIAL-MATCH RETRIEVAL SCHEME BASED ON HASH FUNCTIONS AND DESCRIPTORS. THE EMPHASIS IS PLACED ON SHOWING HOW THE USE OF A DESCRIPTOR FILE CAN IMPROVE THE PERFORMANCE OF THE SCHEME. RECORDS IN THE FILE ARE GIVEN ADDRESSES ACCORDING TO HASH FUNCTIONS FOR EACH FIELD IN THE RECORD. FURTHERMORE, EACH PAGE OF THE FILE HAS ASSOCIATED WITH IT A DESCRIPTOR, WHICH IS A FIXED-LENGTH BIT STRING, DETERMINED BY THE RECORDS ACTUALLY PRESENT IN THE PAGE. BEFORE A PAGE IS ACCESSED TO SEE IF IT CONTAINS RECORDS IN THE ANSWER TO A QUERY, THE DESCRIPTOR FOR THE PAGE IS CHECKED. THIS CHECK MAY SHOW THAT NO RELEVANT RECORDS ARE ON THE PAGE AND, HENCE, THAT THE PAGE DOES NOT HAVE TO BE ACCESSED. THE METHOD IS SHOWN TO HAVE A VERY SUBSTANTIAL PERFORMANCE ADVANTAGE OVER PURE HASHING SCHEMES, WHEN SOME FIELDS IN THE RECORDS HAVE LARGE KEY SPACES. A MATHEMATICAL MODEL OF THE SCHEME, PLUS AN ALGORITHM FOR OPTIMIZING PERFORMANCE, IS GIVEN.

KEYWORDS:

DESIGN * PERFORMANCE * PARTIAL-MATCH RETRIEVAL * HASHING *
DESCRIPTOR * DYNAMIC FILE * OPTIMIZATION

CATEGORIES:

3.63 * 3.74

REFERENCE CODE: 33

JOURNAL:

CACM

VOLUME: 19

ISSUE: 11

DATE: NOVEMBER 1976

PAGES: 634 - 642

TITLE:

OPTIMAL REORGANIZATION OF DISTRIBUTED SPACE DISK FILES

AUTHOR(s):

MARUYAMA, K. * SMITH, S. E.

AFFILIATION:

IBM THOMAS J. WATSON RESEARCH CENTER

ABSTRACT:

IN MOST DATABASE ORGANIZATIONS, THE COST OF ACCESSING THE DATABASE WILL INCREASE DUE TO STRUCTURAL CHANGES CAUSED BY UPDATES AND INSERTIONS. BY REORGANIZING THE DATABASE, THE ACCESS COSTS CAN BE REDUCED. A BASIC PROBLEM IS TO ESTABLISH THE PROPER TRADEOFF BETWEEN PERFORMANCE, STORAGE COSTS, AND REORGANIZATION COSTS. THIS PAPER CONSIDERS THE OPTIMUM POINTS AT WHICH TO REORGANIZE A DATABASE. A DISK FILE ORGANIZATION WHICH ALLOWS FOR DISTRIBUTED FREE SPACE IS DESCRIBED. A COST FUNCTION DESCRIBING THE EXCESS COSTS DUE TO PHYSICAL DISORGANIZATION IS DEFINED, AND THIS FUNCTION IS MINIMIZED TO OBTAIN THE OPTIMUM REORGANIZATION POINTS. NUMERICAL EXAMPLES BASED ON THE CHARACTERISTICS OF EXISTING DISK STORAGE DEVICES ARE GIVEN.

KEYWORDS:

DISK FILE * FREE SPACE * RETRIEVAL * INSERTION *
DETERIORATION * REORGANIZATION

CATEGORIES:

3.70 * 3.73

REFERENCE CODE: 34

JOURNAL:

CACM

VOLUME: 23

ISSUE: 2

DATE: FEBRUARY 1980

PAGES: 71 - 80

TITLE:

A VIRTUAL MACHINE EMULATOR FOR PERFORMANCE EVALUATION

AUTHOR(s):

CANON, M. D. * FRITZ, D. H. * HOWARD, J. H. * HOWELL, T. D.
* MITOMA, M. F. * RODRIGUEZ-ROSELL, J.

AFFILIATION:

IBM SAN JOSE RESEARCH LABORATORY

ABSTRACT:

THE VIRTUAL MACHINE EMULATOR IS AN ENHANCED VERSION OF IBM'S VM/370 PROGRAM THAT EXTENDS THE VIRTUAL MACHINE ENVIRONMENT TO INCLUDE TIMING SIMULATION IN ADDITION TO THE EXISTING SIMULATION OF MACHINE FUNCTION. BY SELECTING PROCESSOR AND I/O DEVICE TIMING CHARACTERISTICS, THE USER CAN EVALUATE THE PERFORMANCE OF A WIDE RANGE OF 370 COMPATIBLE SYSTEMS WITH GREATER FLEXIBILITY AND LOWER COST THAN HARDWARE PROTOTYPING. VALIDATION DATA ARE PRESENTED SHOWING THAT THE EMULATOR IS AN ACCURATE PERFORMANCE PREDICTOR WITH A LOW SIMULATION OVERHEAD.

KEYWORDS:

PERFORMANCE EVALUATION * COMPUTER SYSTEM SIMULATION *
VIRTUAL MACHINES

CATEGORIES:

4.35 * 4.6 * 6.21 * 8.1

REFERENCE CODE: 35

JOURNAL:

CACM

VOLUME: 23

ISSUE: 3

DATE: MARCH 1980

PAGES: 147 - 154

TITLE:

GENERAL CONSIDERATIONS ON THE DESIGN OF AN INTERACTIVE
SYSTEM FOR DATA ANALYSIS

AUTHOR(s):

LING, ROBERT F.

AFFILIATION:

CLEMSON UNIVERSITY

ABSTRACT:

AMONG THE MOST IMPORTANT CRITERIA IN THE DESIGN AND
IMPLEMENTATION OF AN INTERACTIVE SYSTEM FOR DATA ANALYSIS
ARE: DATA STRUCTURE, CONTROL LANGUAGE, USER INTERFACE,

SYSTEM VERSATILITY, EXTENSIBILITY, AND PORTABILITY. THE DESIGN OF AN INTERACTIVE SYSTEM, VIEWED AS A SET OF CONSTRAINED DECISIONS BASED ON THESE CRITERIA, WILL BE DISCUSSED. THE CONCEPTS AND CONSIDERATIONS DISCUSSED IN THIS ARTICLE ABOUT THE DESIGN OF INTERACTIVE SYSTEMS ARE GENERAL IN NATURE AND ARE NEITHER PROBLEM-SPECIFIC NOR DISCIPLINE-SPECIFIC. SPECIFIC EXAMPLES FROM STATISTICAL PACKAGES AND THEIR DESIGNS ARE CITED FOR ILLUSTRATION PURPOSES ONLY.

KEYWORDS:

DESIGN OF INTERACTIVE SYSTEMS * SOFTWARE DESIGN CRITERIA *
USER INTERFACE

CATEGORIES:

3.0 * 4.0

REFERENCE CODE: 36

JOURNAL:

CACM

VOLUME: 23

ISSUE: 4

DATE: APRIL 1980

PAGES: 207 - 213

TITLE:

STUDYING PROGRAMMER BEHAVIOR EXPERIMENTALLY: THE PROBLEMS OF
PROPER METHODOLOGY

AUTHOR(s):

BROOKS, RUVEN E.

AFFILIATION:

THE UNIVERSITY OF TEXAS MEDICAL BRANCH, GALVESTON, TEXAS

ABSTRACT:

THE APPLICATION OF BEHAVIORAL OR PSYCHOLOGICAL TECHNIQUES TO THE EVALUATION OF PROGRAMMING LANGUAGES AND TECHNIQUES IS AN APPROACH WHICH HAS FOUND INCREASED APPLICABILITY OVER THE PAST DECADE. IN ORDER TO USE THIS APPROACH SUCCESSFULLY, INVESTIGATORS MUST PAY CLOSE ATTENTION TO METHODOLOGICAL ISSUES, BOTH IN ORDER TO INSURE THE GENERALIZABILITY OF THEIR FINDINGS AND TO DEFEND THE QUALITY OF THEIR WORK TO RESEARCHERS IN OTHER FIELDS. THREE MAJOR AREAS OF METHODOLOGICAL CONCERN, THE SELECTION OF SUBJECTS, MATERIALS, AND MEASURES, ARE REVIEWED. THE FIRST TWO OF THESE AREAS CONTINUE TO PRESENT MAJOR DIFFICULTIES FOR THIS TYPE OF RESEARCH.

KEYWORDS:

PSYCHOLOGY OF PROGRAMMING * SOFTWARE PSYCHOLOGY

CATEGORIES:

3.36 * 4.5 * 4.6

REFERENCE CODE: 37

JOURNAL:

CACM

VOLUME: 23

ISSUE: 7

DATE: JULY 1980

PAGES: 396 - 410

TITLE:

THE KEYSTROKE-LEVEL MODEL FOR USER PERFORMANCE TIME WITH
INTERACTIVE SYSTEMS

AUTHOR(s):

CARD, STUART K. * MORAN, THOMAS P.

AFFILIATION:

XEROX PALO ALTO RESEARCH CENTER * CARNEGIE-MELLON UNIVERSITY

ABSTRACT:

THERE ARE SEVERAL ASPECTS OF USER-COMPUTER PERFORMANCE THAT SYSTEM DESIGNERS SHOULD SYSTEMATICALLY CONSIDER. THIS ARTICLE PROPOSES A SIMPLE MODEL, THE KEYSTROKE-LEVEL MODEL, FOR PREDICTING ONE ASPECT OF PERFORMANCE: THE TIME IT TAKES AN EXPERT USER TO PERFORM A GIVEN TASK ON A GIVEN COMPUTER SYSTEM. THE MODEL IS BASED ON COUNTING KEYSTROKES AND OTHER LOW-LEVEL OPERATIONS, INCLUDING THE USER'S MENTAL PREPARATIONS AND THE SYSTEM'S RESPONSE. PERFORMANCE IS CODED IN TERMS OF THESE OPERATIONS AND OPERATOR TIMES SUMMED TO GIVE PREDICTIONS. HEURISTIC RULES ARE GIVEN FOR PREDICTING WHERE MENTAL PREPARATIONS OCCUR. WHEN TESTED AGAINST DATA IN 10 DIFFERENT SYSTEMS, THE MODEL'S PREDICTION ERROR IS 21 PERCENT FOR INDIVIDUAL TASKS. AN EXAMPLE IS GIVEN TO ILLUSTRATE HOW THE MODEL CAN BE USED TO PRODUCE PARAMETRIC PREDICTIONS AND HOW SENSITIVITY ANALYSIS CAN BE USED TO REDEEM CONCLUSIONS IN THE FACE OF UNCERTAIN ASSUMPTIONS. FINALLY, THE MODEL IS COMPARED TO SEVERAL SIMPLER VERSIONS. THE POTENTIAL ROLE FOR THE KEYSTROKE-LEVEL MODEL IN SYSTEM DESIGN IS DISCUSSED.

KEYWORDS:

HUMAN-COMPUTER INTERFACE * HUMAN-COMPUTER INTERACTION * USER
MODEL * USER PERFORMANCE * COGNITIVE PSYCHOLOGY * ERGONOMICS
* HUMAN FACTORS * SYSTEMS DESIGN

CATEGORIES:

3.36 * 4.6 * 8.1

REFERENCE CODE: 38

JOURNAL:

CACM

VOLUME: 23

ISSUE: 9

DATE: SEPTEMBER 1980

PAGES: 511 - 521

TITLE:

COMPUTER SYSTEM DESIGN USING A HIERARCHICAL APPROACH TO
PERFORMANCE EVALUATION

AUTHOR(s):

KUMAR, B. * DAVIDSON, E. S.

AFFILIATION:

ELXSI INTERNATIONAL * UNIVERSITY OF ILLINOIS

ABSTRACT:

THE CONCEPT OF A HIERARCHY OF PERFORMANCE MODELS IS INTRODUCED. IT IS ARGUED THAT SUCH A HIERARCHY SHOULD CONSIST OF MODELS SPANNING A WIDE RANGE OF ACCURACY AND COST IN ORDER TO BE A COST-EFFECTIVE TOOL IN THE DESIGN OF COMPUTER SYSTEMS. JUDICIOUS USE OF THE HIERARCHY CAN SATISFY THE CONFLICTING NEEDS OF HIGH ACCURACY AND LOW COST OF PERFORMANCE EVALUATION. A SYSTEM DESIGN PROCEDURE THAT USES THE HIERARCHY IS DEVELOPED. THE CONCEPTS DEVELOPED ARE ILLUSTRATED BY APPLYING THEM TO A CASE STUDY OF SYSTEM DESIGN. THE RESULTS OF OPTIMIZATIONS CONDUCTED USING A TWO-LEVEL PERFORMANCE MODEL HIERARCHY AND A SIMPLE COST MODEL ARE DISCUSSED. IN ALMOST ALL THE EXPERIMENTS CONDUCTED, THE OPTIMIZATION PROCEDURE CONVERGED TO A REGION VERY CLOSE TO A LOCALLY OPTIMUM SYSTEM. THE EFFICIENCY OF THE PROCEDURE IS SHOWN TO BE CONSIDERABLY GREATER THAN THAT OF THE BRUTE FORCE APPROACH TO SYSTEM DESIGN.

KEYWORDS:

HIERARCHICAL MODELING * PERFORMANCE EVALUATION * SYSTEM
DESIGN * OPTIMIZATION ALGORITHMS * HIGH SPEED COMPUTER
SYSTEMS

CATEGORIES:

6.2 * 8.1 * 8.3

REFERENCE CODE: 39

JOURNAL:
JASIS
VOLUME: 29
ISSUE: 1
DATE: JANUARY 1978
PAGES: 31 - 40

TITLE:
EVALUATION OF INFORMATION RETRIEVAL SYSTEMS: A DECISION
THEORY APPROACH

AUTHOR(s):
KRAFT, DONALD H. * BOOKSTEIN, ABRAHAM

AFFILIATION:
SCHOOL OF LIBRARIANSHIP, UNIVERSITY OF CALIFORNIA, BERKELEY
* GRADUATE LIBRARY SCHOOL, UNIVERSITY OF CHICAGO

ABSTRACT:
THE SWETS MODEL OF INFORMATION RETRIEVAL, BASED ON A
DECISION THEORY APPROACH, IS DISCUSSED, WITH THE OVERALL
PERFORMANCE MEASURE BEING THE CRUCIAL ELEMENT REEXAMINED IN
THIS PAPER. THE NEYMAN-PEARSON CRITERION FROM STATISTICAL
DECISION THEORY, AND BASED ON LIKELIHOOD RATIOS, IS USED TO
DETERMINE AN OPTIMAL RANGE OF Z, THE VARIABLE ASSIGNED TO
EACH DOCUMENT BY THE RETRIEVAL SYSTEM IN AN ATTEMPT TO
DISCRIMINATE BETWEEN RELEVANT AND NONRELEVANT DOCUMENTS.
THIS CRITERION IS SHOWN TO BE DIRECTLY RELATED TO BOTH
PRECISION AND RECALL, AND IS EQUIVALENT TO THE MAXIMIZATION
OF THE EXPECTED VALUE OF THE RETRIEVAL DECISION FOR A
SPECIFIC QUERY AND A GIVEN DOCUMENT UNDER CERTAIN
CONDITIONS. THUS, A COMPROMISE CAN BE REACHED BETWEEN THOSE
WHO ADVOCATE PRECISION AS A MEASURE, DUE PARTIALLY TO ITS
ABILITY TO BE EASILY MEASURABLE EMPIRICALLY, AND THOSE WHO
ADVOCATE CONSIDERATION OF RECALL. SEVERAL CASES OF THE
NORMAL AND POISSON DISTRIBUTIONS FOR THE VARIABLE Z ARE
DISCUSSED IN TERMS OF THEIR IMPLICATIONS FOR THE
NEYMAN-PEARSON DECISION RULE. IT IS SEEN THAT WHEN THE
VARIANCES ARE UNEQUAL, THE SWETS RULE OF RETRIEVING A
DOCUMENT IF ITS Z VALUE IS LARGE ENOUGH IS NOT OPTIMAL.
FINALLY, THE SITUATION OF PRECISION AND RECALL NOT BEING
INVERSELY RELATED IS SHOWN TO BE POSSIBLE UNDER CERTAIN
CONDITIONS. THUS, THIS PAPER ATTEMPTS TO EXTEND THE
UNDERSTANDING OF THE THEORETICAL FOUNDATIONS OF THE DECISION
THEORY APPROACH TO INFORMATION RETRIEVAL.

KEYWORDS:
INFORMATION RETRIEVAL SYSTEMS * PERFORMANCE EVALUATION *
INFORMATION MODELING

CATEGORIES:
3.79 * 5.6 * 8.1

REFERENCE CODE: 40

JOURNAL:

JASIS

VOLUME: 29

ISSUE: 6

DATE: NOVEMBER 1978

PAGES: 289 - 296

TITLE:

THE APPLICATION OF MULTIPLE-CRITERIA UTILITY THEORY TO THE
EVALUATION OF INFORMATION SYSTEMS

AUTHOR(s):

HERNER, SAUL * SNAPPER, KURT J.

AFFILIATION:

HERNER AND COMPANY, WASHINGTON, DC

ABSTRACT:

THE USE OF MULTIPLE-CRITERIA THEORY, A MEANS OF MEASURING DEGREE OF SATISFACTION OF PREDETERMINED EVALUATIVE CRITERIA, QUANTIFYING THEIR RELATIVE IMPORTANCE, IDENTIFYING TRADEOFFS AMONG THEM, AND DETERMINING THE BEST TRADEOFFS, IS PROPOSED FOR THE EVALUATION OF INFORMATION SYSTEMS. USE OF THE PROPOSED METHOD IS DEMONSTRATED VIA THE EVALUATION OF A HYPOTHETICAL SELECTIVE DISSEMINATION OF INFORMATION (SDI) SYSTEM. THE ILLUSTRATIVE EVALUATION INVOLVES (1) SELECTION OF TWO SETS OF TYPICALLY ANTITHETIC CRITERIA: EFFICIENCY (THE INNER WORKINGS OF THE SYSTEM) AND EFFECTIVENESS (ITS IMPACT ON ITS USERS); (2) RANKING AND SCORING EACH CRITERION IN THE TWO SETS; (3) SELECTION OF ALTERNATIVE CONFIGURATIONS OF THE SYSTEM UNDER STUDY; (4) SCORING THE SPECIMEN AND THE ALTERNATIVE SYSTEMS IN TERMS OF THE RATED EFFICIENCY AND EFFECTIVENESS CRITERIA; AND (5) IDENTIFYING THE SYSTEM THAT SCORES THE HIGHEST. THE COMPARATIVE SCORES FOR THE SYSTEMS ARE DETERMINED BY $U_i = [(w')(s_i') + (w'')(s_i'')]$, WHERE s_i' AND s_i'' DENOTE THE EFFICIENCY AND EFFECTIVENESS SCORES OF THE i TH ALTERNATIVE, AND w' AND w'' ARE WEIGHTING CONSTANTS THAT REFLECT THE COMPUTED RELATIVE IMPORTANCE OF EFFICIENCY AND EFFECTIVENESS.

KEYWORDS:

PERFORMANCE EVALUATION * SYSTEM DESIGN * RETRIEVAL MODELING
* INFORMATION THEORY

CATEGORIES:

3.79 * 5.0 * 5.6

REFERENCE CODE: 41

JOURNAL:

JASIS

VOLUME: 30

ISSUE: 5

DATE: SEPTEMBER 1979

PAGES: 264 - 268

TITLE:

TWO MODELS FOR PREDICTING SUBJECT CIRCULATION: A
CONTRIBUTION TO THE ALLOCATION PROBLEM

AUTHOR(s):

McGRATH, WILLIAM E.

AFFILIATION:

UNIVERSITY OF LOWELL, LOWELL, MASSACHUSETTS

ABSTRACT:

IT IS SHOWN THAT DIFFERENT SETS OF VARIABLES CAN ACCOUNT FOR NEARLY EQUAL AMOUNTS OF VARIANCE WHEN PREDICTING BOOK CIRCULATION BY SUBJECT. PROPORTION OF VARIANCE (R^2) FOR TWO BASIC MODELS CONTAINING VARIOUS COMBINATIONS OF 21 VARIABLES WERE TESTED. THE FIRST, CALLED THE SHEFLIST MODEL, TREATED THE NUMBER OF LIBRARY BOOKS, WHOSE SUBJECTS MATCH THOSE OF ACADEMIC DEPARTMENTS, AS A CONTROL VARIABLE. AS SUCH, IT ACCOUNTED FOR 67% OF THE VARIANCE, THUS ENTERING THE EQUATION FIRST. WITH THIS MODEL, FOUR SEPARATE SIGNIFICANT SETS EMERGED, EACH ACCOUNTING FOR APPROXIMATELY THE SAME AMOUNT OF VARIANCE (10%). THEY WERE (1) NUMBER OF FACULTY, HARD/SOFT, MASTERS ENROLLMENTS; (2) MASTERS ENROLLMENT, UPPER-LEVEL MAJORS, HARD/SOFT; (3) CREDIT HOURS * TOTAL ENROLLMENTS, HARD/SOFT; (4) UPPER-LEVEL MAJORS, TOTAL MAJORS, ENROLLMENTS LOWER. IN THE SECOND, SHEFLIST WAS CONSTRAINED BY DEFINING THE DEPENDENT VARIABLE AS THE PROPORTION OF SHEFLIST CIRCULATED. WITH THIS MODEL, THREE SEPARATE SIGNIFICANT SETS EMERGED. THESE WERE (5) MASTERS ENROLLMENTS AND HARD/SOFT (20%) VARIANCE; (6) HARD-SOFT AND PH. D. PROGRAM (16%); (7) UPPER-LEVEL MAJORS, AND CREDIT HOURS * TOTAL MAJORS (15%). IN EACH OF THE TESTS, NO OTHER VARIABLES WERE SIGNIFICANT. OF THE 21 VARIABLES, 10 DID NOT APPEAR IN ANY OF THE 7 SETS. ANY OF THE SEVEN SETS COULD BE USED IN AN ALLOCATION FORMULA. THE DECIDING CRITERION FOR CHOOSING A SET MAY DEPEND ON THE CONVENIENCE OF COLLECTING DATA FOR EACH OF THE VARIABLES IN THE SET.

KEYWORDS:

SYSTEM DESIGN * INFORMATION THEORY * SYSTEM MODELING

CATEGORIES:

3.72 * 5.1 * 5.2 * 5.6

REFERENCE CODE: 42

JOURNAL:

JASIS

VOLUME: 31

ISSUE: 1

DATE: JANUARY 1980

PAGES: 5 - 24

TITLE:

INFORMATION SYSTEM DESIGN METHODOLOGY

AUTHOR(s):

WASSERMAN, ANTHONY I.

AFFILIATION:

MEDICAL INFORMATION SCIENCE, UNIVERSITY OF CALIFORNIA AT SAN FRANCISCO

ABSTRACT:

THERE IS A GREAT NEED FOR A SYSTEMATIC APPROACH TO THE SPECIFICATION, DESIGN, AND DEVELOPMENT OF INFORMATION SYSTEMS. THIS ARTICLE DESCRIBES THE MOTIVATING REASONS FOR SUCH AN APPROACH AND SURVEYS SOME OF THE TECHNIQUES THAT HAVE BEEN DEVELOPED TO ASSIST THE SOFTWARE SPECIFICATION AND DESIGN ACTIVITY. A METHODOLOGY IS SEEN AS A COMBINATION OF TOOLS AND TECHNIQUES EMPLOYED WITHIN AN ORGANIZATIONAL AND MANAGERIAL FRAMEWORK THAT CAN BE CONSISTENTLY APPLIED TO SUCCESSIVE INFORMATION SYSTEM DEVELOPMENT PROJECTS. THE WAYS THAT INFORMATION SYSTEM DEVELOPMENT ORGANIZATIONS CAN CREATE AND USE SUCH METHODOLOGIES ARE EMPHASIZED.

KEYWORDS:

INFORMATION THEORY * SYSTEM DESIGN * SYSTEMS ANALYSIS

CATEGORIES:

4.3 * 5.6 * 5.72

REFERENCE CODE: 43

JOURNAL:

JASIS

VOLUME: 31

ISSUE: 4

DATE: JULY 1980

PAGES: 248 - 255

TITLE:

MEASUREMENT IN INFORMATION SCIENCE: OBJECTIVE AND SUBJECTIVE

METRICAL SPACE

AUTHOR(s):

BROOKES, BERTRAM C.

AFFILIATION:

SCHOOL OF LIBRARY AND INFORMATION SCIENCE, UNIVERSITY OF
WESTERN ONTARIO, LONDON, ONTARIO, CANADA

ABSTRACT:

IT IS ARGUED THAT IN INFORMATION SCIENCE WE HAVE TO
DISTINGUISH PHYSICAL, OBJECTIVE, OR DOCUMENT SPACE FROM
PERSPECTIVE, SUBJECTIVE, OR INFORMATION SPACE. THESE TWO
SPACES ARE LIKE MAPS AND LANDSCAPES: EACH IS A SYSTEMATIC
DISTORTION OF THE OTHER. HOWEVER, TRANSFORMATIONS CAN BE
EASILY MADE ONCE THE TWO SPACES ARE DISTINGUISHED. IF THE
TRANSFORMATIONS ARE OMITTED WE ONLY GET UNHELPFUL PHYSICAL
SOLUTIONS TO INFORMATION PROBLEMS.

KEYWORDS:

INFORMATION RETRIEVAL * SYSTEM DESIGN * SYSTEM EVALUATION

CATEGORIES:

3.72 * 4.3 * 5.6

REFERENCE CODE: 44

JOURNAL:

JASIS

VOLUME: 31

ISSUE: 5

DATE: SEPTEMBER 1980

PAGES: 347 - 356

TITLE:

TOWARD USABLE USER STUDIES

AUTHOR(s):

MICK, COLIN K. * LINDSEY, GEORG N. * CALLAHAN, DANIEL

AFFILIATION:

APPLIED COMMUNICATION RESEARCH, INC. * DECISION INFORMATION
SERVICES, LTD.

ABSTRACT:

A MANAGEMENT-ORIENTED MODEL FOR DESCRIBING AND STUDYING
INFORMATION BEHAVIOR IS PROPOSED. THE MODEL FOCUSES ON
VARIABLES WHICH CAN BE MANIPULATED BY MANAGERS --- PRIMARILY
ENVIRONMENTAL AND SITUATIONAL VARIABLES --- RATHER THAN ON
VARIABLES DESCRIBING INDIVIDUAL ATTRIBUTES. SEVERAL
HYPOTHESES DERIVED FROM THE MODEL ARE TESTED USING A

DATABASE DESCRIBING THE INFORMATION-RELATED ATTITUDES AND BEHAVIORS OF SOME 560 SCIENTISTS AND ENGINEERS WORKING IN A VARIETY OF SETTINGS AND ROLES. ALL BUT ONE OF THE HYPOTHESES WERE CONFIRMED, ADDING SUPPORT TO THE MODEL. THE RESULTS OF THESE TESTS SUGGEST THAT ENVIRONMENTAL AND SITUATIONAL CONSTRAINTS PLAY A MAJOR PART IN DETERMINING INFORMATION BEHAVIOR. THEY SUGGEST THAT INTERVENTIONS AIMED AT IMPROVING INFORMATION FLOW WITHIN ORGANIZATIONS MUST BE CAREFULLY TAILORED TO THE SPECIFIC SITUATION IF THEY ARE TO HAVE MAXIMUM IMPACT.

KEYWORDS:

INFORMATION THEORY * INFORMATION MANIPULATION * USER'S BEHAVIOR

CATEGORIES:

2.19 * 3.37

REFERENCE CODE: 45

JOURNAL:

JASIS

VOLUME: 32

ISSUE: 1

DATE: JANUARY 1981

PAGES: 23 - 32

TITLE:

ONLINE SEARCHING: MEASURES THAT DISCRIMINATE AMONG USERS WITH DIFFERENT TYPES OF EXPERIENCES

AUTHOR(s):

FENICHEL, CAROL HANSEN

AFFILIATION:

COLLEGE OF LIBRARY SCIENCE, UNIVERSITY OF KENTUCKY, LEXINGTON

ABSTRACT:

THE PRIMARY GOAL OF THIS RESEARCH WAS TO DISCOVER THOSE BEHAVIORS ASSOCIATED WITH THE PROCESS OF ONLINE BIBLIOGRAPHIC SEARCHING THAT ARE CORRELATED WITH SUCCESS. IN THE ASSUMPTION THAT MORE EXPERIENCED SEARCHERS ARE MORE SUCCESSFUL, THE RESEARCH OBJECTIVES WERE TO IDENTIFY (1) THE DIFFERENCES AMONG THE SEARCHES OF USERS OF ONLINE SYSTEMS WHO HAVE DIFFERENT AMOUNTS OF OVERALL EXPERIENCE AND (2) THE DIFFERENCES BETWEEN THE SEARCHES OF PERSONS WITH AND WITHOUT EXPERIENCE ON THE DATABASE BEING SEARCHED. FIVE GROUPS OF SEARCHERS WITH VARIED OVERALL AND ERIC (EDUCATIONAL RESOURCES INFORMATION CENTER) DATABASE EXPERIENCE PERFORMED PRESELECTED SEARCHES ON THE DIALOG SYSTEM USING ONTAP, THE 1975 SUBSET OF THE ERIC DATABASE. ANALYSIS OF THE SEARCH

TRANSCRIPTS SHOWED THAT DIFFERENCES AMONG THE GROUPS WERE NOT LARGE. COMPARED TO THE EXPERIENCED SUBJECTS, BEGINNING SEARCHERS PERFORMED SURPRISINGLY WELL. THE GROUP WITH THE GREATEST OVERALL EXPERIENCE AND THE GREATEST ERIC DATABASE EXPERIENCE ACHIEVED THE HIGHEST RECALL AND HAD THE HIGHEST VALUES OF A SET OF SEARCH PROCESS VARIABLES DESIGNATED "SEARCH EFFORT" VARIABLES (EG., NUMBER OF COMMANDS AND DESCRIPTORS, CONNECT TIME) SUGGESTING A POSSIBLE RELATIONSHIP BETWEEN SEARCH EFFORT AND RECALL.

KEYWORDS:

INFORMATION RETRIEVAL * USER'S BEHAVIOR * DATABASE * PERFORMANCE EVALUATION

CATEGORIES:

2.19 * 3.37 * 3.51 * 3.74 * 3.81

REFERENCE CODE: 46

JOURNAL:

JASIS

VOLUME: 32

ISSUE: 1

DATE: JANUARY 1981

PAGES: 51 - 64

TITLE:

THE RELATIONAL MODEL IN INFORMATION RETRIEVAL

AUTHOR(s):

CRAWFORD, ROBERT G.

AFFILIATION:

DEPARTMENT OF COMPUTING AND INFORMATION SCIENCE, QUEEN'S UNIVERSITY, KINGSTON, ONTARIO, CANADA

ABSTRACT:

THE RELATIONAL MODEL HAS RECEIVED INCREASING ATTENTION DURING THE PAST DECADE. ITS ADVANTAGES INCLUDE SIMPLICITY, CONSISTENCY, AND A SOUND THEORETICAL BASIS. IN THIS ARTICLE, THE NATURALNESS OF VIEWING INFORMATION RETRIEVAL RELATIONALLY IS DEMONSTRATED. THE RELATIONAL MODEL IS PRESENTED, AND THE RELATIONAL ORGANIZATION OF A BIBLIOGRAPHICAL DATABASE IS SHOWN. THE NOTION OF NORMALIZATION IS INTRODUCED AND FIRST, SECOND, THIRD, AND FOURTH NORMAL FORMS ARE DEMONSTRATED. RELATIONAL LANGUAGES ARE DISCUSSED, INCLUDING THE RELATIONAL CALCULUS, RELATIONAL ALGEBRA, AND SEQUEL. NUMEROUS EXAMPLES PERTINENT TO INFORMATION RETRIEVAL ARE PRESENTED IN THESE RELATIONAL LANGUAGES. ADVANTAGES OF THE RELATIONAL APPROACH TO INFORMATION RETRIEVAL ARE NOTED.

KEYWORDS:

DATABASE * INFORMATION RETRIEVAL * QUERY LANGUAGES *
RELATIONAL MODEL * RELATIONAL LANGUAGES * RELATIONAL
MODELING * INFORMATION MODELING

CATEGORIES:

3.72 * 4.2 * 4.34 * 5.6 * 5.7

REFERENCE CODE: 47

JOURNAL:

JASIS

VOLUME: 32

ISSUE: 5

DATE: SEPTEMBER 1981

PAGES: 325 - 333

TITLE:

A STATE TRANSITION ANALYSIS OF ONLINE INFORMATION-SEEKING
BEHAVIOR

AUTHOR(s):

CHAPMAN, JANET L.

AFFILIATION:

SCHOOL OF LIBRARY AND INFORMATION SCIENCE, DREXEL
UNIVERSITY, PHILADELPHIA

ABSTRACT:

STATISTICAL ANALYSES OF ONLINE SEARCHING PATTERNS COMPARED THE USAGE OF A QUERY LANGUAGE BY VARIOUS GROUPS OF SEARCHERS. DATA WERE GATHERED BY AN EXPERIMENTAL PROJECT, INDIVIDUALIZED INSTRUCTION FOR DATA ACCESS (IIDA), CONCERNED WITH DEVELOPING AND TESTING A SYSTEM WHICH SERVES AS A TEACHER AND ASSISTANT TO USERS OF LOCKHEED'S DIALOG SYSTEM. SEQUENTIAL LISTINGS OF USER COMMANDS WERE CLASSIFIED BY CORRESPONDING STATE CODES TO REPRESENT PHASES OF SEARCHING. ZERO-THROUGH FOURTH-ORDER MARKOVIAN ANALYSES OF INDIVIDUAL COMMANDS AND STRINGS OF LIKE COMMANDS WERE PERFORMED TO COMPARE SEARCHING PROCEDURES USED BY THREE CLASSES OF USERS. CLASS 1 COMPARED NOVICES DIFFERING IN THEIR USE OF IIDA AS AN ADJUNCT TRAINER; CLASS 2 COMPARED INEXPERIENCED, IIDA-TRAINED SEARCHERS WITH PROFESSIONAL SEARCHERS; CLASS 3 COMPARED INEXPERIENCED SEARCHERS TAUGHT BY EITHER IIDA OR PROFESSIONAL SEARCHERS. ANALYSIS REVEALED THAT SEARCHERS TEND TO FOLLOW THE ADVICE OF THEIR TRAINER, WHETHER IT BE HUMAN OR COMPUTER. THE USE OF IIDA AS THE SOLE TRAINING METHOD APPEARS TO PRODUCE SEARCHERS WHO USE SIMILAR PATTERNS OF SEARCHING. THE USE OF ANOTHER TRAINING METHOD IN ADDITION TO OR INSTEAD OF IIDA APPEARS TO PRODUCE SEARCHERS WITH

VARIED AND INDIVIDUAL "STYLES" OF ONLINE SEARCHING.

KEYWORDS:

ONLINE INFORMATION * SYSTEM EVALUATION * INFORMATION SEARCH
* DIALOG * IIDA * STATISTICAL ANALYSIS * SEARCH *
INFORMATION RETRIEVAL

CATEGORIES:

2.19 * 3.37 * 3.74 * 4.22 * 5.6

REFERENCE CODE: 48

JOURNAL:

JASIS

VOLUME: 33

ISSUE: 5

DATE: SEPTEMBER 1982

PAGES: 325 - 332

TITLE:

A COMPUTER INTERMEDIARY FOR INTERACTIVE DATABASE SEARCHING.
I. DESIGN

AUTHOR(s):

MEADOW, CHARLES T. * HEWETT, THOMAS T. * AVERSA, ELIZABETH S.

AFFILIATION:

DREXEL UNIVERSITY, PHILADELPHIA

ABSTRACT:

THIS IS THE FIRST OF TWO ARTICLES THAT REPORT ON THE DEVELOPMENT, TESTING, AND EVALUATION OF THE INDIVIDUALIZED INSTRUCTION FOR DATA ACCESS SYSTEM (IIDA). IIDA IS AN EXAMPLE OF A CLASS OF COMPUTER SYSTEMS WHICH SERVE AS INTERMEDIARIES, ENABLING THEIR USERS TO PERFORM A COMPLEX TASK ON ANOTHER COMPUTER, AND WHICH ARE COMING TO BE KNOWN AS EXPERT SYSTEMS. THE SYSTEM WAS DESIGNED TO ENCOURAGE END USERS OF INFORMATION RETRIEVAL SYSTEMS TO PERFORM THEIR OWN SEARCHES BY (1) INSTRUCTING THEM IN HOW TO SEARCH, USING COMPUTER-ASSISTED INSTRUCTION, AND (2) ASSISTING WITH THE PERFORMANCE OF THE SEARCH BY PROVIDING DIAGNOSTIC ANALYSES OF THE USER'S PERFORMANCE AS WELL AS ANSWERING THEIR QUESTIONS ABOUT HOW TO USE SYSTEM COMMANDS. THE SYSTEM'S DESIGN IS DESCRIBED, AS WELL AS THE VARIOUS TESTS OF ITS PERFORMANCE AND THE EVALUATION OF TEST RESULTS. THE CONCLUSION IS DRAWN THAT END USERS CAN BECOME SUCCESSFUL SEARCHERS THROUGH SUCH AN ASSISTANT, FOR THE KINDS OF SEARCHES TESTED.

KEYWORDS:

INFORMATION RETRIEVAL * DATABASE * SEARCHING * SYSTEM DESIGN

* DATA ACCESS * SYSTEM EVALUATION * PERFORMANCE

CATEGORIES:

2.19 * 3.72 * 3.74 * 4.3 * 5.6

REFERENCE CODE: 49

JOURNAL:

JASIS

VOLUME: 33

ISSUE: 6

DATE: NOVEMBER 1982

PAGES: 357 - 364

TITLE:

A COMPUTER INTERMEDIARY FOR INTERACTIVE DATABASE SEARCHING.
II. EVALUATION

AUTHOR(s):

MEADOW, CHARLES T. * HEWETT, THOMAS T. * AVERSA, ELIZABETH S.

AFFILIATION:

DREXEL UNIVERSITY, PHILADELPHIA

ABSTRACT:

THIS IS THE SECOND OF TWO ARTICLES DESCRIBING THE DEVELOPMENT, TESTING, AND EVALUATION OF THE INDIVIDUALIZED INSTRUCTION FOR DATA BASE ACCESS SYSTEM (IIDA). THE SYSTEM WAS TESTED IN AN INDUSTRIAL SETTING AND IT WAS DEMONSTRATED THAT (1) END USERS OF SCIENTIFIC AND TECHNICAL LITERATURE COULD LEARN TO DO THEIR OWN BIBLIOGRAPHIC SEARCHES THROUGH COMPUTER-ASSISTED INSTRUCTION AS WELL AS THEY LEARNED THROUGH A COMPARABLE PERIOD OF CONVENTIONAL INSTRUCTION, AND (2) END USERS WERE AS SATISFIED WITH THE RESULTS OF THEIR OWN SEARCHINGS AS WITH THE RESULT OF SEARCHES PERFORMED FOR THEM, FOR THE TYPES OF SEARCHES TESTED.

KEYWORDS:

INFORMATION RETRIEVAL * DATABASES * SEARCHING * SYSTEM
EVALUATION * PERFORMANCE

CATEGORIES:

2.19 * 3.7 * 3.74 * 4.3 * 5.6

REFERENCE CODE: 50

JOURNAL:

JASIS

VOLUME: 33

ISSUE: 6
DATE: NOVEMBER 1982
PAGES: 375 - 382

TITLE:
THE SYSTEMS MOVEMENT: AN OVERVIEW FOR INFORMATION SCIENTISTS

AUTHOR(s):
MANSFIELD, UNA

AFFILIATION:
DEPARTMENT OF ECONOMICS, PRINCETON UNIVERSITY, PRINCETON

ABSTRACT:
THE FOCUS OF INFORMATION RESEARCH IN ANY GIVEN DISCIPLINE DEPENDS ON THE MEANING OF THE WORD "INFORMATION" FOR SCIENTISTS IN THAT DISCIPLINE. THIS ARTICLE LISTS SOME OF THE "DISCIPLINES OF INFORMATION", INCLUDING SEVERAL WITH A STRONG SYSTEMS ORIENTATION, AND IDENTIFIES THOSE INFORMATION SCIENTISTS FOR WHOM A KNOWLEDGE OF SYSTEMS METHODOLOGY IS IMPORTANT. THIS IS FOLLOWED BY A BROADBRUSH TREATMENT OF THE MODERN SYSTEMS MOVEMENT: ITS ROLE IN THE CHANGING WORLDVIEW OF SCIENCE, SOME DISCIPLINES (EG., CYBERNETICS AND OPERATIONS RESEARCH) THAT HAVE CONTRIBUTED TO ITS DEVELOPMENT, AND THE DISTINCTION THAT CAN BE DRAWN BETWEEN GENERAL SYSTEMS THEORY (GST) AND OTHER APPROACHES TO THE STUDY OF SYSTEMS --- A THEME DEVELOPED BY MATTESSICH IN THE ARTICLE THAT FOLLOWS.

KEYWORDS:
INFORMATION RETRIEVAL * INFORMATION RESEARCH * SYSTEMS THEORY

CATEGORIES:
3.6 * 3.7 * 5.6

REFERENCE CODE: 51

JOURNAL:
JASIS
VOLUME: 34
ISSUE: 1
DATE: JANUARY 1983
PAGES: 31 - 39

TITLE:
EXPLOITING THE MAXIMUM ENTROPY PRINCIPLE TO INCREASE RETRIEVAL EFFECTIVENESS

AUTHOR(s):
COOPER, WILLIAM S.

AFFILIATION:
SCHOOL OF LIBRARY AND INFORMATION STUDIES, UNIVERSITY OF
CALIFORNIA, BERKELEY

ABSTRACT:
SEVERAL OF THE DRAWBACKS OF CONVENTIONAL INFORMATION
RETRIEVAL SYSTEMS CAN BE OVERCOME BY A DESIGN APPROACH IN
WHICH QUERIES CONSIST OF SETS OF TERMS, EITHER UNWEIGHTED OR
WEIGHTED WITH SUBJECTIVE TERM PRECISION ESTIMATES, AND
RETRIEVAL OUTPUTS ARE RANKED BY PROBABILITY OF USEFULNESS
ESTIMATED IN ACCORDANCE WITH THE SO-CALLED "MAXIMUM ENTROPY
PRINCIPLE". A SYSTEM ORGANIZED ALONG THESE LINES COMBINES
THE CONVENIENCE OF A SIMPLE INPUT LANGUAGE WITH A POWERFUL
PROBABILISTIC INFERENCE MECHANISM CAPABLE OF EXPLOITING
KINDS OF STATISTICAL CLUES NOT ORDINARILY USED IN SYSTEMS OF
TRADITIONAL DESIGN. THE SENSITIVITY OF THE MAXIMUM ENTROPY
PRINCIPLE TO THE FREQUENCIES AND JOINT FREQUENCIES WITH
WHICH TERMS HAVE BEEN ASSIGNED TO DOCUMENTS IN THE
COLLECTION RESULTS IN A SYSTEM DESIGN OF INCREASED POWER AND
EXPRESSIVENESS WITHOUT A CONCOMITANT INCREASE IN THE
COMPLEXITY OF THE REQUEST LANGUAGE. IT INCORPORATES THE MORE
IMPORTANT SEARCH CAPABILITIES OF BOTH BOOLEAN AND
CONVENTIONAL WEIGHTED-REQUEST LANGUAGES AND FACILITATES THE
USE OF UNCONVENTIONAL SEARCH CLUES.

KEYWORDS:
INFORMATION RETRIEVAL * SYSTEMS DESIGN * INFORMATION MODELING

CATEGORIES:
3.7 * 4.22 * 4.6 * 5.2 * 5.23 * 5.6

REFERENCE CODE: 52

JOURNAL:
JASIS
VOLUME: 35
ISSUE: 1
DATE: JANUARY 1984
PAGES: 3 - 10

TITLE:
STATISTICAL RECOGNITION OF CONTENT TERMS IN GENERAL TEXT

AUTHOR(s):
DILLON, MARTIN * FEDERHART, PEGGY

AFFILIATION:
SCHOOL OF LIBRARY SCIENCE, UNIVERSITY OF NORTH CAROLINA *
LIBRARY, IBM CORPORATION, CHARLOTTE

ABSTRACT:

THIS ARTICLE DISCUSSES WAYS TO IMPROVE THE QUALITY OF RETRIEVAL SYSTEMS THAT DEPEND ON THE USE OF TRUNCATED WORDS OR QUASI-WORD STEMS AS AN INDEXING VOCABULARY. THE PROBLEMS ADDRESSED ARE THE GENERALIZABILITY AND STABILITY OF DISCRIMINATE FUNCTION ANALYSIS FOR SELECTING GOOD TOPICAL TERMS FROM ABSTRACTS OF HARRIS SURVEY PRESS RELEASES. RESULTS CONFIRM THAT TOPICAL TERMS CAN BE IDENTIFIED BY THEIR STATISTICAL PROPERTIES. CONSISTENTLY HIGH RECALL OF TOPICAL TERMS UNDER A VARIETY OF DIFFERENT CONDITIONS IMPLIES PERSISTENT UNDERLYING PROPERTIES STRONG ENOUGH TO RESIST CHANGES IN TEST ENVIRONMENT.

KEYWORDS:

INFORMATION RETRIEVAL * SEARCHING * FUNCTION ANALYSIS

CATEGORIES:

1.1 * 4.3 * 4.6 * 5.6

REFERENCE CODE: 53

JOURNAL:

JASIS

VOLUME: 35

ISSUE: 1

DATE: JANUARY 1984

PAGES: 19 - 28

TITLE:

LESS THAN FULL-TEXT INDEXING USING A NON-BOOLEAN SEARCHING MODEL

AUTHOR(s):

CLEVELAND, DONALD B. * CLEVELAND, ANA D. * WISE, OLGA B.

AFFILIATION:

SCHOOL OF LIBRARY AND INFORMATION SCIENCES, NORTH TEXAS STATE UNIVERSITY * TEXAS, WOMAN'S UNIVERSITY, DENTON

ABSTRACT:

THE RELATIVE EFFECTIVENESS OF INDEXING USING FULL-TEXT OR LESS THAN FULL-TEXT WAS TESTED USING A NON-BOOLEAN, CHAINING TYPE OF FILE STRUCTURE AND SEARCHING METHOD. INDEXING WAS DONE USING TITLES, ABSTRACTS, FULL-TEXT, REFERENCES, AND VARIOUS COMBINATIONS OF THESE SURROGATES AND THEN GOFFMAN'S INDIRECT METHOD OF INFORMATION RETRIEVAL WAS USED TO STRUCTURE AND SEARCH THE FILE. THE DATABASE CONSISTED OF 733 DOCUMENTS AND 38 QUERIES WERE SEARCHED. THE HYPOTHESIS OF THE STUDY AS A FILE STRUCTURING AND SEARCHING TECHNIQUE, FULL-TEXT INDEXING IS NOT ESSENTIAL TO OPTIMUM INFORMATION RETRIEVAL EFFECTIVENESS. THE OUTCOME OF THE STUDY WAS POSITIVE.

KEYWORDS:

SEARCHING * PERFORMANCE EVALUATION * INFORMATION RETRIEVAL *
FILE STRUCTURE

CATEGORIES:

3.74 * 4.3 * 4.6 * 5.6

ATTACHMENT 6.10

**USL/DBMS NASA/RECON
MULTICS WORKBENCH SPECIFICATIONS**

N A S A

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USL/DBMS NASA/RECON
MULTICS WORKBENCH SPECIFICATIONS

08/02/84

Philip Hall

There are presently seven major components of the workbench which are available from the main menu. These provide utilities for management of NASA Project storage space on MULTICS, electronic mail management for communications among project participants, utilities for storage and printing of mailing labels for external mailings, utilities for controlling access to NASA procedures and documents stored on MULTICS, procedures for storage and updating of NASA/RECON project control documents and a maintenance system for control of books kept in the NASA/RECON library.

Version 2 of the MULTICS workbench was completed on July 31, 1984. New functions added during the Summer of 1984 were access control, execution of MULTICS commands from within the workbench, finding and listing of updated segments, and manipulation of information related to NASA/PC equipment purchases. Integrity control for all system documents was also incorporated into the system as was integrity control relating to

M U L T I C S

- 1 -

W O R K B E N C H

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recovery from system errors.

The seven major branches from the root of the system are listed below and the functions which they perform are summarized.

M U L T I C S

- 2 -

W O R K B E N C H

I. SEGMENTS PROCESSING.

- A. Allow user to specify different Laser printer font selections for the Laser printing of documents.
- B. Add standard formats in headers/footers, such as date, title, or other user-specified information.
- C. Provides integration of related segments into archives and generation of integrated runout documents from related runoff segments. Standard names must be followed by all programs and users to ensure compatability. Archive configurations should also be similar, i.e., <subject>.<term>.archive.
- D. Provides a listing of all available segments in given directories and/or archives.

II. TAPE BACKUP PROCESSOR.

- A. Provides tape contents for standard tapes used in the DEMS NASA/RECON project as well as user-defined tapes.
- B. Provides storage and retrieval absentee requests for all authorized tape users.

III. MULTICS MAILING LIST FORMATTER.

- A. Provides for mailing list generation.
- B. Provides for updates to existing mailing lists.
- C. Provides capability of creating a segment and sending the contents of the segment to members of a mailing list.
- D. Allows users to display contents of a mailing list.
- E. Allows users to display names of all available mailing lists.
- F. Saves all mail in a logmailbox and allows users to read mail in that mailbox.

IV. MAILING LABELS LIST PROCESSOR.

- A. Provides capabilities of creating lists of sendees for all NASA related mailouts.
- B. Provides for printing of existing mailing labels lists.
- C. Provides mailing label list add/delete/update/list facility.
- D. Provides for the printing of mailing labels through the MULTICS label printing facilities.

V. ADMINISTRATIVE FUNCTIONS

A. Access Control

1. List all segments accessible to a user.
2. List all users with access to a directory.
3. List all users with access to a segment.
4. Set access for combinations of segment lists or single segments to user lists or single users.
5. Create and update lists of users to be given identical access.
6. Create and update lists of segments and directories which are to be treated as a unit in setting access rights.

- B. Check for segments which have been updated subsequent to a user-supplied date in a single directory or a root directory and its sub-tree.

VI. STATUS DOCUMENT PROCESSOR.

- A. Process outlay/status document
(NASA/PC Capital Expenditures).
 - 1. Add new entries to the document.
 - 2. Process any required updates to the document.
 - 3. Print single or multiple copies of the document on either the I/O room printer or the CMPS printer.
- B. Print single copies of outlay/status document.
- C. Process tasks/status document.
(Project task control document).
 - 1. Add new entries to the document.
 - 2. Process any required updates to the document.
 - 3. Provide report generation based on:
 - i. Person responsible for a task.
 - ii. Status of a given task.
 - iii. Completion date of a given task.
 - iv. List of tasks for a given person.
 - v. List of tasks to be completed by a date.
 - 4. Print copies of the task/status document on the I/O room printer or the CMPS printer.
 - 5. Initialization of a new tasks/status document.
- D. Print single copies of the tasks/status document.

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N A S A

VII. CHECKOUT OF NASA/RECON DOCUMENTS.

- A. Create a file of documents.
- B. Add documents to a file.
- C. Process checkout of a given document.
- D. Process return of a borrowed document.
- E. Process and send mail to any individual with overdue documents.
- F. Provide ability to trace documents to the current user.
- G. Print a document file.

M U L T I C S

W O R K B E N C H

1. Report No.		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle FY 1983-1984 Final Report to the National Aeronautics and Space Administration on NASA Contract Number NASW-3846 "NASA Recon: Course Development, Administration and Evaluation"				5. Report Date 08/31/84	
				6. Performing Organization Code	
7. Author(s) Wayne D. Dominick Leroy Roquemore				8. Performing Organization Report No.	
9. Performing Organization Name and Address University of Southwestern Louisiana P. O. Box 44330 Lafayette, LA 70504 Southern University Southern Branch Post Office Baton Rouge, LA 70813				10. Work Unit No.	
				11. Contract or Grant No. NASW-3846	
12. Sponsoring Agency Name and Address				13. Type of Report and Period Covered	
				14. Sponsoring Agency Code	
15. Supplementary Notes					
16. Abstract <p>In December, 1983, the National Aeronautics and Space Administration (NASA) entered into a contractual agreement (NASA Contract Number NASW-3846) with the University of Southwestern Louisiana (USL) and Southern University (SU) for contracted research and development activities addressing the development, administration, and evaluation of a set of transportable, college-level courses to education science and engineering students in the effective use of automated scientific and technical information storage and retrieval systems, and, in particular, in the use of the NASA RECON system.</p> <p>This FY 1983-84 Final Report identifies completed documentation/deliverables and on-going progress in the following six areas:</p> <ol style="list-style-type: none"> 1) Overall Project Management and Control 2) Needs Analysis Phase 3) Course Development Phase 4) Working Paper Series Information Dissemination 5) PC R&D Supportive Research and PC R&D Working Paper Series 6) Other Research Support Activities 					
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1. Report No.		2. Government Accession No.		3. Recipient's Catalog No.	
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15. Supplementary Notes					
16. Abstract <p>In December, 1983, the National Aeronautics and Space Administration (NASA) entered into a contractual agreement (NASA Contract Number NASW-3846) with the University of Southwestern Louisiana (USL) and Southern University (SU) for contracted research and development activities addressing the development, administration, and evaluation of a set of transportable, college-level courses to educate science and engineering students in the effective use of automated scientific and technical information storage and retrieval systems, and, in particular, in the use of the NASA RECON system.</p> <p>This Executive Summary of the FY 1983-1984 Final Report on NASA Contract Number NASW-3846 briefly overviews the long-range scope and objectives of these contracted activities and highlights the progress which has been made toward these objectives during FY 1983-1984.</p> <p>All supportive documentation is presented in the final report itself, entitled "FY 1983-1984 Final Report to the National Aeronautics and Space Administration on NASA Contract Number NASW-3846, NASA Recon: Course Development, Administration, and Evaluation."</p>					
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